APOLLO G&N
EQUIPMENT TEST
DATA SHEET 12 OF 19

JDC
NO. 05374
REV. D

JOB: MARGINAL FREQUENCY-VOLTAGE AND THERMAL TEST

C. PROCEDURE (Cont'd)	Results	Limits
196. CONTROL 2 adjustment		16.40 ± 0.01 vdc
199. No Failures occur		Testman's Stamp
202. No Failures occur		Testman's Stamp
204. CONTROL 2 adjustment		12.10 ± 0.01 vdc
207. CONTROL 1 adjustment		3.40 ± 0.01 vdc
208. No Failures occur		Testman's Stamp
210. CONTROL 2 adjustment		16.40 ± 0.01 vdc
212. No Failures occur		Testman's Stamp
213. CONTROL 2 adjustment		12.10 ± 0.01 vdc
216. CONTROL 1 adjustment		4.50 ± 0.01 vdc
217. No Failures occur		Testman's Stamp
219. CONTROL 2 adjustment		16.40 ± 0.01 vdc
221. No Failures occur		Testman's Stamp
223. No Failures occur		Testmans' Stamp
277. No Failures Occurred		Testman's Stamp
283. Control 1 Adjustment		3.40 ± 0.01 VDC
285. Control 2 Adjustment		12.10 ± 0.01 VDC

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 13 OF 19

JDC
NO. 05374
REV. D

JOB: MARGINAL FREQUENCY-VOLTAGE AND THERMAL TEST

C. PROCEDURE (Cont'd)	Results	Limits
293. No Failures Occurred		Testman's Stamp
294. Control 2 Adjustment		16.40 ± 0.01 VDC
302. No Failures Occurred		Testman's Stamp
303. Control 2 Adjustment		12.10 ± 0.01 VDC
305. Control 1 Adjustment		4.50 ± 0.01 VDC
313. No Failures Occurred		Testman's Stamp
315. Control 2 Adjustment		16.40 ± 0.01 VDC
323. No Failures Occurred		Testman's Stamp
325. (a) Resistance		
(b) Temperature equivalent		
(c) Frequency		
(d) Date and time		
330. Frequency adjustment		1.126 ± 0.005 MC
335. Chamber temperature		$0^{\circ} \pm 3^{\circ}C$
337. (a) Resistance		
(b) Temperature equivalent		
(c) Date and time		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 14 OF 19

JDC
NO. 05374
REV. D

JOB: MARGINAL FREQUENCY-VOLTAGE AND THERMAL TEST

C. PROCEDURE (Cont'd)	Results	Limits
344. (a) Resistance		
(b) Temperature Equivalent		
(c) Frequency		
(d) Date and time		
346. No Failures occur		Testman's Stamp
351. CONTROL 1 adjustment		3.80 ± 0.01 vdc
353. CONTROL 2 adjustment		12.10 ± 0.01 vdc
356. No Failures occur		Testman's Stamp
357. CONTROL 2 adjustment		16.40 ± 0.01 vdc
360. No Failures occur		Testman's Stamp
361. CONTROL 2 adjustment		12.10 ± 0.01 vdc
364. CONTROL 1 adjustment		4.50 ± 0.01 vdc
366. No Failures occur		Testman's Stamp
368. CONTROL 2 adjustment		16.40 ± 0.01 vdc
371. No Failures occur		Testman's Stamp
374. No Failure occur		Testman's Stamp
376. CONTROL 2 adjustment		12.10 ± 0.01 vdc

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 15 OF 19

JDC
NO. 05374
REV. D

JOB: MARGINAL FREQUENCY-VOLTAGE AND THERMAL TEST

C. PROCEDURE (Cont'd)	Results	Limits
379. CONTROL 1 adjustment		3.80 ± 0.01 vdc
380. No Failures occur		Testman's Stamp
382. CONTROL 2 adjustment		16.40 ± 0.01 vdc
384. No Failures occur		Testman's Stamp
385. CONTROL 2 adjustment		12.10 ± 0.01 vdc
388. CONTROL 1 adjustment		4.50 ± 0.01 vdc
389. No Failures occur		Testman's Stamp
391. CONTROL 2 adjustment		16.40 ± 0.01 vdc
393. No Failures occur		Testman's Stamp
395. No Failures occur		Testman's Stamp
450. No Failures occurred		Testman's Stamp
456. CONTROL 1 adjustment		3.40 ± 0.01 vdc
458. CONTROL 2 adjustment		12.10 ± 0.01 vdc
466. No Failures occurred		Testman's Stamp
467. CONTROL 2 adjustment		16.40 ± 0.01 vdc
475. No Failures occurred		Testman's Stamp
476. CONTROL 2 adjustment		12.10 ± 0.01 vdc

DATE ______

Released with ATP 1009502

JDC 10710 REV. A PAGE 1 OF 4
INITIAL TDRR 19950 D.S. PGS 14

JOB SCT TRUNNION ACCURACY TEST

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION SCT trunnion accuracy is checked by comparing SCT panel trunnion angle counter, 2X TRUNNION CDU readout and trunnion encoder output with Rotary Table angles. Operation of SCT in OFFSET 25° and LANDMARK LOS 0° modes is also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-16-65	22524	1, 3	A11	MGM	TM

REFERENCES ATP 1009502, Paragraphs 3-3.14, 3-3.10 and 3-3.15 and JDC's 10734 and 10706

IMPORTANT JDC 10706 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

NOTE: Assure that the Counter, Phase Angle Voltmeter (PAVM), and 2-1/2-inch autocollimator reticle lamp have been energized at least 15 minutes immediately prior to use in this test.

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON
OPTICS POWER ON
BLOCK I SERIES 100.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

ZERO OPTICS
CONTROLLER DIRECT
SCT DRIVE NORMAL
SXT DRIVE NORMAL.

4. Assure that the following pushbuttons are not lighted:

TRACKER
TRACKER POWER.

5. Set switches as follows:

SHAFT SLEW CONTROL to OFF

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ______

TRUNNION SLEW CONTROL to OFF
SLAVE TELESCOPE to STAR LOS.

6. After CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton on Remote Optics Controller to light the MANUAL indicator.

7. Connect the 2X TRUNNION CDU encoder output to the Counter by setting the COUNTER INPUT "A" OR "AB" selector on Primary Signal Selector panel to 16.

8. Set selectors on Counter to perform forward-reverse counting function as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 1
CLOCK SELECTOR to INT
FUNCTION to COUNT
INPUT SELECTOR to A-B
SENSE SELECTOR to FWD.

9. Use TRUNNION SLEW CONTROL switch and COARSE and FINE GAIN CONTROL on Remote Optics Controller to drive 2X TRUNNION CDU while adjusting ATTEN, SLOPE, and TRIGGER switches and controls on channels A and B of the Counter.

10. Press the MANUAL/ZERO OPTICS pushbutton to light the ZERO OPTICS indicator.

11. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

12. Connect SCT Trunnion 1X resolver error signal to PAVM by setting Primary Signal Selector to 109.

13. Set the FREQUENCY switch on the PAVM to 800~ No. 1.

14. Use SHAFT SLEW CONTROL switch and COARSE and FINE GAIN CONTROL to drive the SHAFT ANGLE CDU to 270.000 (±0.005)°.

15. Press the RESET pushbutton on Counter.

NOTE: When positioning the Rotary Table, always approach the final setting in the increasing direction. To determine Rotary Table indications, take the average of a set of five readings of the optigon arc-second scale, offsetting the vernier knob before each setting.

16. Set the tilt axis of the Rotary Table to 0° 00' 00" (±1").

B. PROCEDURE

1. Add each of the incremental angles in the following table to the ZRP established in JDC 10706. If the sum is greater than 360°, subtract 360°. Position the Rotary Table rotary axis to within ±1 arc second of each of the calculated angles. At each Rotary Table setting, perform the following steps:

DATE ______

---

a. Sight through the SCT eyepiece and use the TRUNNION SLEW CONTROL switch and COARSE and FINE GAIN CONTROL on the Remote Optics Controller to position the 2-1/2-inch autocollimator reticle at the center of the SCT reticle pattern as shown in figure 1. Use the SHAFT SLEW CONTROL switch and COARSE and FINE GAIN CONTROL to adjust the SCT shaft angle if necessary.

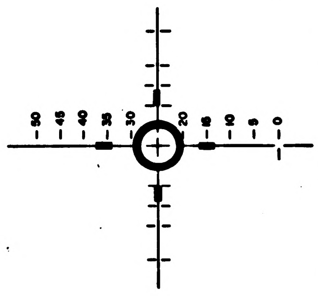

Figure 1. Coincident Reticles

b. Record 2X TRUNNION CDU, Counter, and SCT panel trunnion angle counter indications.

c. Monitor the PAVM to determine and record magnitude and sign of in-phase and quadrature components of SCT Trunnion 1X resolver error signal.

ROTARY TABLE INCREMENTS

(1)	0°	00'	00"
(2)	4°	00'	00"
(3)	11°	00'	00"
(4)	16°	00'	00"
(5)	22°	00'	00"
(6)	30°	00'	00"
(7)	36°	00'	00"
(8)	40°	00'	00"
(9)	45°	00'	00"
(10)	50°	00'	00"
(11)	54°	00'	00"
(12)	57°	00'	00"
(13)	0°	00'	00"

2. Set SLAVE TELESCOPE switch on Remote Optics Controller to OFFSET 25°.

3. Sight through SCT eyepiece and adjust Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is centered on the 0 mark of the SCT reticle as shown in Figure 2. Record Rotary Table rotary axis readout.

DATE ______

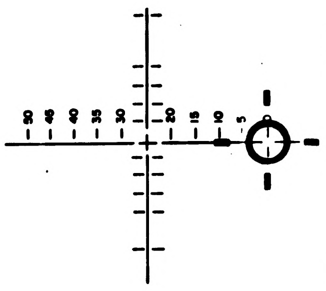

Figure 2. Reticles at 25° OFFSET

4. Sight through the SCT eyepiece and adjust the Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is positioned at the junction of the SCT reticle pattern crosshairs. Record Rotary Table rotary axis readout.

5. Subtract the value recorded in step B.3 from the value recorded in step B.4. Record the difference.

6. Subtract the Rotary Table ZRP recorded in JDC 10706 from the value recorded in step B.4. Record the difference.

7. Set SLAVE TELESCOPE switch to LDMK LOS position.

8. Sight through the SCT eyepiece and adjust the Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is positioned at the junction of the SCT reticle pattern crosshairs. Record Rotary Table rotary axis readout.

9. Subtract the Rotary Table ZRP recorded in JDC 10706 from the value recorded in step B.8. Record the difference.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 14

JDC
NO. 10710
REV. A
INITIAL TORR 1:950

JOB SCT TRUNNION ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL. DATE
NAME ____ SER. NO. ____ CAL. DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(1)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+0° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	359.262		0.738		
	Encoder Count	pulses	(-)133		(+)133		
	Trunnion Angle Counter	deg	359.87		0.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(2)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+4° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	7.262		8.738		
	Encoder Count	pulses	1323		1589		
	Trunnion Angle Counter	deg	3.87		4.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(3)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+11° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	21.262		22.738		
	Encoder Count	pulses	3872		4138		
	Trunnion Angle Counter	deg	10.87		11.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(4)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+16° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	31.262		32.738		
	Encoder Count	pulses	5692		5958		
	Trunnion Angle Counter	deg	15.87		16.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(5)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+22° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	43.262		44.738		
	Encoder Count	pulses	7877		8143		
	Trunnion Angle Counter	deg	21.87		22.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(6)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+30° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	59.262		60.738		
	Encoder Count	pulses	10790		11056		
	Trunnion Angle Counter	deg	29.87		30.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(7)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+36° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	71.262		72.738		
	Encoder Count	pulses	12974		13240		
	Trunnion Angle Counter	deg	35.87		36.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 8 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(8)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+40° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	79.262		80.738		
	Encoder Count	pulses	14431		14697		
	Trunnion Angle Counter	deg	39.87		40.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 9 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(9)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+45° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	89.262		90.738		
	Encoder Count	pulses	16251		16517		
	Trunnion Angle Counter	deg	44.87		45.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 10 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(10)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+50° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	99.262		100.738		
	Encoder Count	pulses	18071		18337		
	Trunnion Angle Counter	deg	49.87		50.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 11 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(11)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+54° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	107.262		108.738		
	Encoder Count	pulses	19528		19794		
	Trunnion Angle Counter	deg	53.87		54.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 12 OF 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(12)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+57° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	113,26		114,738		
	Encoder Count	pulses	20620		20886		
	Trunnion Angle Counter	deg	56.87		57.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 13 **OF** 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(13)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+0° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	359.262		0.738		
	Encoder Count	pulses	(-)133		(+)133		
	Trunnion Angle Counter	deg	359.87		0.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ________

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 14 **OF** 14

JDC
NO. 10710
REV. A

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	Rotary Table Rotary Axis Readout	deg min sec		° ' "			
B.3	Rotary Table Rotary Axis Readout	deg min sec		(-) ° ' "			
B.5	B.4 - B.3	deg min sec	24° 45' 00"	° ' "	25° 15' 00"		
B.4	Rotary Table Rotary Axis Readout	deg min sec		° ' "			
	Rotary Table ZRP from JDC 10706	deg min sec		(-) ° ' "			
B.6	B.4 - ZRP	deg min sec	24° 48' 00"	° ' "	25° 12' 00"		
B.8	Rotary Table Rotary Axis Readout	deg min sec		° ' "			
	Rotary Table ZRP from JDC 10706	deg min sec		(-) ° ' "			
B.9	B.8 - ZRP	min sec	-7'	( ) ' "	+7'		

DATE ________

Released with ATP 1009502

JOB SCT TRUNNION ACCURACY TEST | JDC 10710 REV. B PAGE 1 OF 4
INITIAL TDRR 19950 D.S. PGS 13

SUBSYSTEM OPTICAL | ASSY.

DESCRIPTION SCT trunnion accuracy is checked by comparing SCT panel trunnion angle counter, 2X TRUNNION CDU readout and trunnion encoder output with Rotary Table angles. Operation of SCT in OFFSET 25° and LANDMARK LOS 0° modes is also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-16-65	22524	1, 3	A11	MGM	TM
B	12-22-65	24848	3	12, 13, 14	WK	-

REFERENCES ATP 1009502, Paragraphs 3-3.14, 3-3.10 and 3-3.15 and JDC's 10734 and 10706

IMPORTANT JDC 10706 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

NOTE: Assure that the Counter, Phase Angle Voltmeter (PAVM), and 2-1/2-inch autocollimator reticle lamp have been energized at least 15 minutes immediately prior to use in this test.

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:
   OIA ON
   OPTICS POWER ON
   BLOCK I SERIES 100.
3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:
   ZERO OPTICS
   CONTROLLER DIRECT
   SCT DRIVE NORMAL
   SXT DRIVE NORMAL.
4. Assure that the following pushbuttons are not lighted:
   TRACKER
   TRACKER POWER.
5. Set switches as follows:
   SHAFT SLEW CONTROL to OFF

VERIFICATION WITH SIDL REQUIRED BEFORE USE

TRUNNION SLEW CONTROL to OFF
SLAVE TELESCOPE to STAR LOS.

6. After CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton on Remote Optics Controller to light the MANUAL indicator.
7. Connect the 2X TRUNNION CDU encoder output to the Counter by setting the COUNTER INPUT "A" OR "AB" selector on Primary Signal Selector panel to 16.
8. Set selectors on Counter to perform forward-reverse counting function as follows:
   DISPLAY TIME (N_2) to 10^6
   DISPLAY RESET to ZERO
   CLOCK FREQUENCY DIVIDER to 1
   CLOCK SELECTOR to INT
   FUNCTION to COUNT
   INPUT SELECTOR to A-B
   SENSE SELECTOR to FWD.
9. Use TRUNNION SLEW CONTROL switch and COARSE and FINE GAIN CONTROL on Remote Optics Controller to drive 2X TRUNNION CDU while adjusting ATTEN, SLOPE, and TRIGGER switches and controls on channels A and B of the Counter.
10. Press the MANUAL/ZERO OPTICS pushbutton to light the ZERO OPTICS indicator.
11. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.
12. Connect SCT Trunnion 1X resolver error signal to PAVM by setting Primary Signal Selector to 109.
13. Set the FREQUENCY switch on the PAVM to 800~ No. 1.
14. Use SHAFT SLEW CONTROL switch and COARSE and FINE GAIN CONTROL to drive the SHAFT ANGLE CDU to 270.000 (±0.005)°.
15. Press the RESET pushbutton on Counter.

NOTE: When positioning the Rotary Table, always approach the final setting in the increasing direction. To determine Rotary Table indications, take the average of a set of five readings of the optigon arc-second scale, offsetting the vernier knob before each setting.

16. Set the tilt axis of the Rotary Table to 0° 00' 00" (±1").

B. PROCEDURE

1. Add each of the incremental angles in the following table to the ZRP established in JDC 10706. If the sum is greater than 360°, subtract 360°. Position the Rotary Table rotary axis to within ±1 arc second of each of the calculated angles. At each Rotary Table setting, perform the following steps:

---

a. Sight through the SCT eyepiece and use the TRUNNION SLEW CONTROL switch and COARSE and FINE GAIN CONTROL on the Remote Optics Controller to position the 2-1/2-inch autocollimator reticle at the center of the SCT reticle pattern as shown in figure 1. Use the SHAFT SLEW CONTROL switch and COARSE and FINE GAIN CONTROL to adjust the SCT shaft angle if necessary.

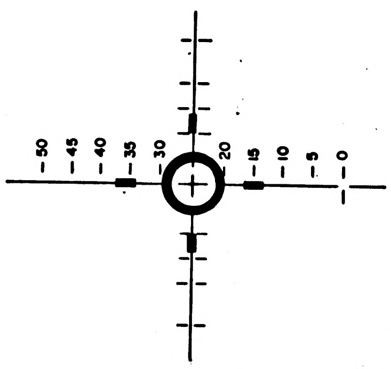

Figure 1. Coincident Reticles

b. Record 2X TRUNNION CDU, Counter, and SCT panel trunnion angle counter indications.

c. Monitor the PAVM to determine and record magnitude and sign of in-phase and quadrature components of SCT Trunnion 1X resolver error signal.

ROTARY TABLE INCREMENTS

(1)	0°	00'	00"
(2)	4°	00'	00"
(3)	11°	00'	00"
(4)	16°	00'	00"
(5)	22°	00'	00"
(6)	30°	00'	00"
(7)	36°	00'	00"
(8)	40°	00'	00"
(9)	45°	00'	00"
(10)	50°	00'	00"
(11)	54°	00'	00"
(12)	0°	00'	00"

2. Set SLAVE TELESCOPE switch on Remote Optics Controller to OFFSET 25°.
3. Sight through SCT eyepiece and adjust Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is centered on the 0 mark of the SCT reticle as shown in Figure 2. Record Rotary Table rotary axis readout.

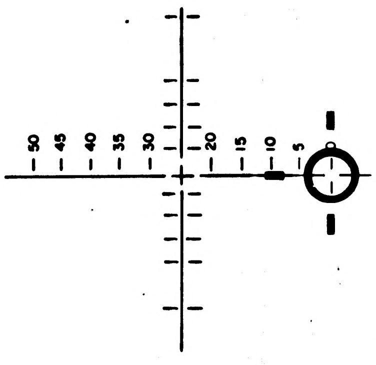

Figure 2. Reticles at 25° OFFSET

4. Sight through the SCT eyepiece and adjust the Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is positioned at the junction of the SCT reticle pattern crosshairs. Record Rotary Table rotary axis readout.
5. Subtract the value recorded in step B.3 from the value recorded in step B.4. Record the difference.
6. Subtract the Rotary Table ZRP recorded in JDC 10706 from the value recorded in step B.4. Record the difference.
7. Set SLAVE TELESCOPE switch to LDMK LOS position.
8. Sight through the SCT eyepiece and adjust the Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is positioned at the junction of the SCT reticle pattern crosshairs. Record Rotary Table rotary axis readout.
9. Subtract the Rotary Table ZRP recorded in JDC 10706 from the value recorded in step B.8. Record the difference.

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EQUIPMENT TEST
DATA SHEET 1 OF 13

JDC
NO. 10710
REV. B
INITIAL TDRR 19950

JOB SCT TRUNNION ACCURACY TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(1)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+0° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	359.262		0.738		
	Encoder Count	pulses	(-)133		(+)133		
	Trunnion Angle Counter	deg	359.87		0.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

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EQUIPMENT TEST
DATA SHEET 2 OF 13

JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(2)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+4° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	7.262		8.738		
	Encoder Count	pulses	1323		1589		
	Trunnion Angle Counter	deg	3.87		4.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

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EQUIPMENT TEST
DATA SHEET 3 OF 13

JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(3)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+11° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	21.262		22.738		
	Encoder Count	pulses	3872		4138		
	Trunnion Angle Counter	deg	10.87		11.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

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EQUIPMENT TEST
DATA SHEET 4 OF 13

JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(4)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+16° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	31.262		32.738		
	Encoder Count	pulses	5692		5958		
	Trunnion Angle Counter	deg	15.87		16.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

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EQUIPMENT TEST
DATA SHEET 5 **OF** 13

JDC
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REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(5)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+22° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	43.262		44.738		
	Encoder Count	pulses	7877		8143		
	Trunnion Angle Counter	deg	21.87		22.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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EQUIPMENT TEST
DATA SHEET 6 **OF** 13

JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(6)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+30° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	59.262		60.738		
	Encoder Count	pulses	10790		11056		
	Trunnion Angle Counter	deg	29.87		30.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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EQUIPMENT TEST
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JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(7)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+36° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	71.262		72.738		
	Encoder Count	pulses	12974		13240		
	Trunnion Angle Counter	deg	35.87		36.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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EQUIPMENT TEST
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JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(8)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+40° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	79.262		80.738		
	Encoder Count	pulses	14431		14697		
	Trunnion Angle Counter	deg	39.87		40.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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EQUIPMENT TEST
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JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(9)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+45° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	89.262		90.738		
	Encoder Count	pulses	16251		16517		
	Trunnion Angle Counter	deg	44.87		45.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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EQUIPMENT TEST
DATA SHEET 10 **OF** 13

JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(10)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+50° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	99.262		100.738		
	Encoder Count	pulses	18071		18337		
	Trunnion Angle Counter	deg	49.87		50.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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EQUIPMENT TEST
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JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(11)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+54° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	107.262		108.738		
	Encoder Count	pulses	19528		19794		
	Trunnion Angle Counter	deg	53.87		54.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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EQUIPMENT TEST
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JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(12)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+0° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	359.262		0.738		
	Encoder Count	pulses	(-)133		(+)133		
	Trunnion Angle Counter	deg	359.87		0.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 13 OF 13

JDC
NO. 10710
REV. B

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	Rotary Table Rotary Axis Readout	deg min sec		° ' "			
B.3	Rotary Table Rotary Axis Readout	deg min sec		(-) ° ' "			
B.5	B.4 - B.3	deg min sec	24° 45' 00"	° ' "	25° 15' 00"		
B.4	Rotary Table Rotary Axis Readout	deg min sec		° ' "			
	Rotary Table ZRP from JDC 10706	deg min sec		(-) ° ' "			
B.6	B.4 - ZRP	deg min sec	24° 48' 00"	° ' "	25° 12' 00"		
B.8	Rotary Table Rotary Axis Readout	deg min sec		° ' "			
	Rotary Table ZRP from JDC 10706	deg min sec		(-) ° ' "			
B.9	B.8 - ZRP	min sec	-7'	( ) ' "	+7'		

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Released with ATP 1009502

JDC 10710 REV. C PAGE 1 OF 4

JOB SCT TRUNNION ACCURACY TEST

INITIAL TDRR 19950 D.S. PGS 13

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION SCT trunnion accuracy is checked by comparing SCT panel trunnion angle counter, 2X TRUNNION CDU readout and trunnion encoder output with Rotary Table angles. Operation of SCT in OFFSET 25° and LANDMARK LOS 0° modes is also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-16-65	22524	1, 3	A11	MGM	TM
B	12-22-65	24848	3	12, 13, 14	WK	-
C	8-4-66	30395	2	-	EA	-

REFERENCES ATP 1009502, Paragraphs 3-3.14, 3-3.10 and 3-3.15 and JDC's 10734 and 10706

IMPORTANT JDC 10706 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

NOTE: Assure that the Counter, Phase Angle Voltmeter (PAVM), and 2-1/2-inch autocollimator reticle lamp have been energized at least 15 minutes immediately prior to use in this test.

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON
OPTICS POWER ON
BLOCK I SERIES 100.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

ZERO OPTICS
CONTROLLER DIRECT
SCT DRIVE NORMAL
SXT DRIVE NORMAL.

4. Assure that the following pushbuttons are not lighted:

TRACKER
TRACKER POWER.

5. Set switches as follows:

SHAFT SLEW CONTROL to OFF

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB SCT TRUNNION ACCURACY TEST

JDC 10710 REV C PAGE 2 OF 4

SUBSYSTEM OPTICAL

ASSY

TRUNNION SLEW CONTROL to OFF
SLAVE TELESCOPE to STAR LOS.

6. After CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton on Remote Optics Controller to light the MANUAL indicator.
7. Connect the 2X TRUNNION CDU encoder output to the Counter by setting the COUNTER INPUT "A" OR "AB" selector on Primary Signal Selector panel to 16.
8. Set selectors on Counter to perform forward-reverse counting function as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 1
CLOCK SELECTOR to INT
FUNCTION to COUNT
INPUT SELECTOR to A-B
SENSE SELECTOR to FWD.

9. Use TRUNNION SLEW CONTROL switch and COARSE and FINE GAIN CONTROL on Remote Optics Controller to drive 2X TRUNNION CDU while adjusting ATTEN, SLOPE, and TRIGGER switches and controls on channels A and B of the Counter.
10. Press the MANUAL/ZERO OPTICS pushbutton to light the ZERO OPTICS indicator.
11. After the CDU's have zeroed, press the RESET pushbutton on the counter.
12. Press the MANUAL/ZERO OPTICS pushbutton on Remote Optics Controller to light the MANUAL indicator.
13. Connect SCT Trunnion 1X resolver error signal to PAVM by setting Primary Signal Selector to 109.
14. Set the FREQUENCY switch on the PAVM to 800~ No. 1.
15. Use SHAFT SLEW CONTROL switch and COARSE and FINE GAIN CONTROL to drive the SHAFT ANGLE CDU to 270.000 (±0.005)°.

NOTE: When positioning the Rotary Table, always approach the final setting in the increasing direction. To determine Rotary Table indications, take the average of a set of five readings of the optigon arc-second scale, offsetting the vernier knob before each setting.

16. Set the tilt axis of the Rotary Table to 0° 00' 00" (±1").

B. PROCEDURE

1. Add each of the incremental angles in the following table to the ZRP established in JDC 10706. If the sum is greater than 360°, subtract 360°. Position the Rotary Table rotary axis to within ±1 arc second of each of the calculated angles. At each Rotary Table setting, perform the following steps:

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JOB SCT TRUNNION ACCURACY TEST

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SUBSYSTEM OPTICAL

ASSY

a. Sight through the SCT eyepiece and use the TRUNNION SLEW CONTROL switch and COARSE and FINE GAIN CONTROL on the Remote Optics Controller to position the 2-1/2-inch autocollimator reticle at the center of the SCT reticle pattern as shown in figure 1. Use the SHAFT SLEW CONTROL switch and COARSE and FINE GAIN CONTROL to adjust the SCT shaft angle if necessary.

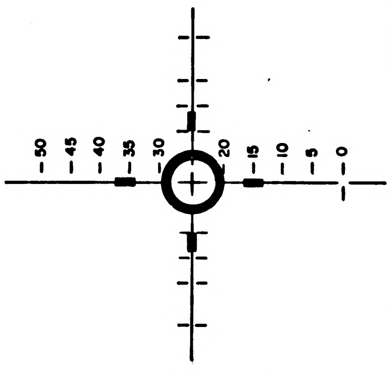

Figure 1. Coincident Reticles

b. Record 2X TRUNNION CDU, Counter, and SCT panel trunnion angle counter indications.

c. Monitor the PAVM to determine and record magnitude and sign of in-phase and quadrature components of SCT Trunnion 1X resolver error signal.

ROTARY TABLE INCREMENTS

(1)	0°	00'	00"
(2)	4°	00'	00"
(3)	11°	00'	00"
(4)	16°	00'	00"
(5)	22°	00'	00"
(6)	30°	00'	00"
(7)	36°	00'	00"
(8)	40°	00'	00"
(9)	45°	00'	00"
(10)	50°	00'	00"
(11)	54°	00'	00"
(12)	0°	00'	00"

2. Set SLAVE TELESCOPE switch on Remote Optics Controller to OFFSET 25°.
3. Sight through SCT eyepiece and adjust Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is centered on the 0 mark of the SCT reticle as shown in Figure 2. Record Rotary Table rotary axis readout.

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JOB SCT TRUNNION ACCURACY TEST

JDC 10710 REV C PAGE 4 OF 4

SUBSYSTEM OPTICAL

ASSY

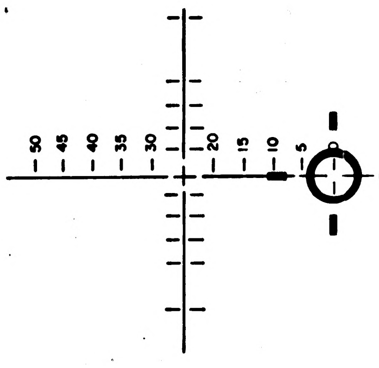

Figure 2. Reticles at 25° OFFSET

4. Sight through the SCT eyepiece and adjust the Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is positioned at the junction of the SCT reticle pattern crosshairs. Record Rotary Table rotary axis readout.
5. Subtract the value recorded in step B.3 from the value recorded in step B.4. Record the difference.
6. Subtract the Rotary Table ZRP recorded in JDC 10706 from the value recorded in step B.4. Record the difference.
7. Set SLAVE TELESCOPE switch to LDMK LOS position.
8. Sight through the SCT eyepiece and adjust the Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is positioned at the junction of the SCT reticle pattern crosshairs. Record Rotary Table rotary axis readout.
9. Subtract the Rotary Table ZRP recorded in JDC 10706 from the value recorded in step B.8. Record the difference.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 13

NO. 10710 JDC
REV. C
INITIAL TDRR 19950

JOB SCT TRUNNION ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(1)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+0° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	359.262		0.738		
	Encoder Count	pulses	(-)133		(+)133		
	Trunnion Angle Counter	deg	359.87		0.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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EQUIPMENT TEST
DATA SHEET 2 OF 13

JDC
NO. 10710
REV. C

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(2)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+4° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	7.262		8.738		
	Encoder Count	pulses	1323		1589		
	Trunnion Angle Counter	deg	3.87		4.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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EQUIPMENT TEST
DATA SHEET 3 OF 13

JDC
NO. 10710
REV. C

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(3)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+11° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	21.262		22.738		
	Encoder Count	pulses	3872		4138		
	Trunnion Angle Counter	deg	10.87		11.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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JDC
NO. 10710
REV. C

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(4)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+16° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	31.262		32.738		
	Encoder Count	pulses	5692		5958		
	Trunnion Angle Counter	deg	15.87		16.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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JDC
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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(5)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+22° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	43.262		44.738		
	Encoder Count	pulses	7877		8143		
	Trunnion Angle Counter	deg	21.87		22.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

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JDC
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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(6)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+30° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	59.262		60.738		
	Encoder Count	pulses	10790		11056		
	Trunnion Angle Counter	deg	29.87		30.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(7)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+36° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	71.262		72.738		
	Encoder Count	pulses	12974		13240		
	Trunnion Angle Counter	deg	35.87		36.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

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JDC
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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(8)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+40° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	79.262		80.738		
	Encoder Count	pulses	14431		14697		
	Trunnion Angle Counter	deg	39.87		40.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

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JDC
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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(9)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+45° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	89.262		90.738		
	Encoder Count	pulses	16251		16517		
	Trunnion Angle Counter	deg	44.87		45.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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JDC
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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(10)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+50° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	99.262		100.738		
	Encoder Count	pulses	18071		18337		
	Trunnion Angle Counter	deg	49.87		50.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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JDC
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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(11)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+54° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	107.262		108.738		
	Encoder Count	pulses	19528		19794		
	Trunnion Angle Counter	deg	53.87		54.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(12)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+0° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	359.262		0.738		
	Encoder Count	pulses	(-)133		(+)133		
	Trunnion Angle Counter	deg	359.87		0.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	Rotary Table Rotary Axis Readout	deg min sec		° ' "			
B.3	Rotary Table Rotary Axis Readout	deg min sec		(-) ° ' "			
B.5	B.4 - B.3	deg min sec	24° 45' 00"	° ' "	25° 15' 00"		
B.4	Rotary Table Rotary Axis Readout	deg min sec		° ' "			
	Rotary Table ZRP from JDC 10706	deg min sec		(-) ° ' "			
B.6	B.4 - ZRP	deg min sec	24° 48' 00"	° ' "	25° 12' 00"		
B.8	Rotary Table Rotary Axis Readout	deg min sec		° ' "			
	Rotary Table ZRP from JDC 10706	deg min sec		(-) ° ' "			
B.9	B.8 - ZRP	min sec	-7'	( ) ' "	+7'		

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Released with ATP 1009502

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INITIAL TDRR 19950 D.S. PGS 15

JOB SCT TRUNNION ACCURACY TEST

ASSY.

SUBSYSTEM OPTICAL

DESCRIPTION SCT trunnion accuracy is checked by comparing SCT panel trunnion angle counter, 2X TRUNNION CDU readout and trunnion encoder output with Rotary Table angles. Operation of SCT in OFFSET 25° and LANDMARK LOS 0° modes is also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ATP 1009502, Paragraphs 3-3.1, 3-3.14.2, 3-3.15, 3-3.16. JDC 10734, 10706

IMPORTANT JDC 10706 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

NOTE: Assure that the Counter, Phase Angle Voltmeter (PAVM), and 2-1/2-inch autocollimator reticle lamp have been energized at least 15 minutes immediately prior to use in this test.

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:
   OIA ON/ISS POWER DISABLED
   OPTICS POWER ON
   BLOCK I SERIES 100.
3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:
   ZERO OPTICS
   CONTROLLER DIRECT
   SCT DRIVE NORMAL
   SXT DRIVE NORMAL.
4. Assure that the following pushbuttons are not lighted:
   TRACKER
   TRACKER POWER.
5. Set switches as follows:
   SHAFT SLEW CONTROL to OFF

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ______

JOB SCT TRUNNION ACCURACY TEST JDC 10710 REV PAGE 2 OF 4

SUBSYSTEM OPTICAL ASSY

   TRUNNION SLEW CONTROL to OFF
   SLAVE TELESCOPE to STAR LOS.
6. After CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton on Remote Optics Controller to light the MANUAL indicator.
7. Connect the 2X TRUNNION CDU encoder output to the Counter by setting the COUNTER INPUT "A" OR "AB" selector on Primary Signal Selector panel to 16.
8. Set selectors on Counter to perform forward-reverse counting function as follows:
   DISPLAY TIME (N_2) to 10^5
   DISPLAY RESET to ZERO
   CLOCK FREQUENCY DIVIDER to 1
   CLOCK SELECTOR to INT
   FUNCTION to COUNT
   INPUT SELECTOR to A-B
   SENSE SELECTOR to FWD.
9. Use TRUNNION SLEW CONTROL switch and COARSE and FINE GAIN CONTROL on Remote Optics Controller to drive 2X TRUNNION CDU while adjusting ATTEN, SLOPE, and TRIGGER switches and controls on channels A and B of the Counter.
10. Press the MANUAL/ZERO OPTICS pushbutton to light the ZERO OPTICS indicator.
11. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.
12. Connect SCT Trunnion 1X resolver error signal to PAVM by setting Primary Signal Selector to 109.
13. Set the FREQUENCY switch on the PAVM to 800~ No. 1.
14. Use SHAFT SLEW CONTROL switch and COARSE and FINE GAIN CONTROL to drive the SHAFT ANGLE CDU to 270.000 (±0.005)°.
15. Press the RESET pushbutton on Counter.

    NOTE: When positioning the Rotary Table, always approach the final setting in the increasing direction. To determine Rotary Table indications, take the average of a set of five readings of the optigon arc-second scale, offsetting the vernier knob before each setting.

16. Set the tilt axis of the Rotary Table to 0° 00' 00" (±1").

B. PROCEDURE

1. Add each of the incremental angles in the following table to the ZRP established in JDC 10706. If the sum is greater than 360°, subtract 360°. Position the Rotary Table rotary axis to within ±1 arc second of each of the calculated angles. At each Rotary Table setting, perform the following steps:

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JOB SCT TRUNNION ACCURACY TEST JDC 10710 REV PAGE 3 OF 4

SUBSYSTEM OPTICAL ASSY

a. Sight through the SCT eyepiece and use the TRUNNION SLEW CONTROL switch and COARSE and FINE GAIN CONTROL on the Remote Optics Controller to position the 2-1/2-inch autocollimator reticle at the center of the SCT reticle pattern as shown in figure 1. Use the SHAFT SLEW CONTROL switch and COARSE and FINE GAIN CONTROL to adjust the SCT shaft angle if necessary.

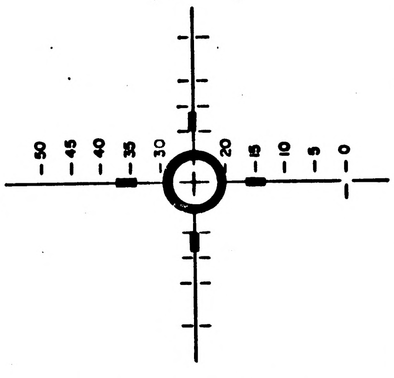

Figure 1. Coincident Reticles

b. Record 2X TRUNNION CDU, Counter, and SCT panel trunnion angle counter indications.

c. Monitor the PAVM to determine and record magnitude and sign of in-phase and quadrature components of SCT Trunnion 1X resolver error signal.

ROTARY TABLE INCREMENTS

(1)	0°	00'	00"
(2)	5°	00'	00"
(3)	10°	00'	00"
(4)	15°	00'	00"
(5)	20°	00'	00"
(6)	25°	00'	00"
(7)	30°	00'	00"
(8)	35°	00'	00"
(9)	40°	00'	00"
(10)	45°	00'	00"
(11)	50°	00'	00"
(12)	53°	00'	00"
(13)	57°	00'	00"
(14)	0°	00'	00"

2. Set SLAVE TELESCOPE switch on Remote Optics Controller to OFFSET 25°.
3. Sight through SCT eyepiece and adjust Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is centered on the 0 mark of the SCT reticle as shown in Figure 2. Record Rotary Table rotary axis readout.

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JOB SCT TRUNNION ACCURACY TEST JDC 10710 REV PAGE 4 OF 4

SUBSYSTEM OPTICAL ASSY

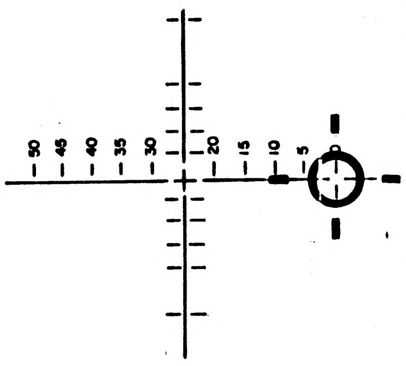

Figure 2. Reticles at 25° OFFSET

4. Sight through the SCT eyepiece and adjust the Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is positioned at the junction of the SCT reticle pattern crosshairs. Record Rotary Table rotary axis readout.
5. Subtract the value recorded in step B.3 from the value recorded in step B.4. Record the difference.
6. Subtract the Rotary Table ZRP recorded in JDC 10706 from the value recorded in step B.4. Record the difference.
7. Set SLAVE TELESCOPE switch to LDMK LOS position.
8. Sight through the SCT eyepiece and adjust the Rotary Table rotary axis until the reticle pattern of the 2-1/2-inch autocollimator is positioned at the junction of the SCT reticle pattern crosshairs. Record Rotary Table rotary axis readout.
9. Subtract the Rotary Table ZRP recorded in JDC 10706 from the value recorded in step B.8. Record the difference.

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JOB SCT TRUNNION ACCURACY TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ____	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(1)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+0° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	359.262		0.738		
	Encoder Count	pulses	(-)133		(+)133		
	Trunnion Angle Counter	deg	359.87		0.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 15

JDC
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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(2)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+5° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	9.262		10.738		
	Encoder Count	pulses	1687		1933		
	Trunnion Angle Counter	deg	4.87		5.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 15

JDC
NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(3)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+10° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	19.262		20.738		
	Encoder Count	pulses	3508		3774		
	Trunnion Angle Counter	deg	9.87		10.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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JDC
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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(4)	Rotary Table ZRP from JDC 10706	deg min sec		° ' "			
	Rotary Table Increment	deg min sec		+15° 00' 00"			
	Rotary Table Position	deg min sec		° ' "			
	2X TRUNNION CDU	deg	29.262		30.738		
	Encoder Count	pulses	5508		5774		
	Trunnion Angle Counter	deg	14.87		15.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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APOLLO G & N
EQUIPMENT TEST
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JDC NO. 10710
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JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(5)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+20° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	39.262		40.738		
	Encoder Count	pulses	7149		7415		
	Trunnion Angle Counter	deg	19.87		20.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

DATE ______

APOLLO G & N
EQUIPMENT TEST
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JDC NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(6)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+25° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	49.262		50.738		
	Encoder Count	pulses	8969		9235		
	Trunnion Angle Counter	deg	24.87		25.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

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EQUIPMENT TEST
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JDC NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(7)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+30° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	59.262		60.738		
	Encoder Count	pulses	10790		11056		
	Trunnion Angle Counter	deg	29.87		30.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 8 OF 15

JDC NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(8)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+35° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	69.262		70.738		
	Encoder Count	pulses	12610		12876		
	Trunnion Angle Counter	deg	34.87		35.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

DATE ______

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JDC
NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(9)	Rotary Table ZRP from JDC 10706	deg min sec		____° ____' ____"			
	Rotary Table Increment	deg min sec		+40° 00' 00"			
	Rotary Table Position	deg min sec		____° ____' ____"			
	2X TRUNNION CDU	deg	79.262		80.738		
	Encoder Count	pulses	14431		14697		
	Trunnion Angle Counter	deg	39.87		40.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

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NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(10)	Rotary Table ZRP from JDC 10706	deg min sec		____° ____' ____"			
	Rotary Table Increment	deg min sec		+45° 00' 00"			
	Rotary Table Position	deg min sec		____° ____' ____"			
	2X TRUNNION CDU	deg	89.262		90.738		
	Encoder Count	pulses	16251		16517		
	Trunnion Angle Counter	deg	44.87		45.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 11 **OF** 15

JDC
NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(11)	Rotary Table ZRP from JDC 10706	deg min sec		____° ____' ____"			
	Rotary Table Increment	deg min sec		+50° 00' 00"			
	Rotary Table Position	deg min sec		____° ____' ____"			
	2X TRUNNION CDU	deg	99.262		100.738		
	Encoder Count	pulses	18071		18337		
	Trunnion Angle Counter	deg	49.87		50.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 12 **OF** 15

JDC
NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(12)	Rotary Table ZRP from JDC 10706	deg min sec		____° ____' ____"			
	Rotary Table Increment	deg min sec		+53° 00' 00"			
	Rotary Table Position	deg min sec		____° ____' ____"			
	2X TRUNNION CDU	deg	105.262		106.738		
	Encoder Count	pulses	19164		19430		
	Trunnion Angle Counter	deg	52.87		53.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv					
	SCT Trunnion 1X Resolver Quadrature Voltage	mv					

DATE ____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 13 OF 15

JDC
NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(13)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+57° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	113.262		114.733		
	Encoder Count	pulses	20620		20886		
	Trunnion Angle Counter	deg	56.87		57.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

DATE ________

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 14 OF 15

JDC
NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.1(14)	Rotary Table ZRP from JDC 10706	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table Increment	deg min sec	▨	+0° 00' 00"	▨	▨	▨
	Rotary Table Position	deg min sec	▨	° ' "	▨	▨	▨
	2X TRUNNION CDU	deg	359.262		0.738		
	Encoder Count	pulses	(-)133		(+)133		
	Trunnion Angle Counter	deg	359.87		0.13		
	SCT Trunnion 1X Resolver In-Phase Voltage	mv	▨		▨	▨	▨
	SCT Trunnion 1X Resolver Quadrature Voltage	mv	▨		▨	▨	▨

DATE ________

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 15 OF 15

JDC
NO. 10710
REV. ____

JOB SCT TRUNNION ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	Rotary Table Rotary Axis Readout	deg min sec	▨	° ' "	▨	▨	▨
B.3	Rotary Table Rotary Axis Readout	deg min sec	▨	(-) ° ' "	▨	▨	▨
B.5	B.4 - B.3	deg min sec	24° 45' 00"	° ' "	25° 15' 00"		
B.4	Rotary Table Rotary Axis Readout	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table ZRP from JDC 10706	deg min sec	▨	(-) ° ' "	▨	▨	▨
B.6	B.4 - ZRP	deg min sec	24° 48' 00"	° ' "	25° 12' 00"		
B.8	Rotary Table Rotary Axis Readout	deg min sec	▨	° ' "	▨	▨	▨
	Rotary Table ZRP from JDC 10706	deg min sec	▨	(-) ° ' "	▨	▨	▨
B.9	B.8 - ZRP	min sec	-7'	( ) ' "	+7'		

DATE ________

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC 10711 REV. A PAGE 1 OF 5

INITIAL TDRR 19950 D.S. PGS 3

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Check of maximum drive rates, minimum output voltage of Optics Hand Controller, and Resolver Mode Operation.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22223	1	3	WK	TM

REFERENCES ATP 1009502, Paragraphs 3-3.11 and JDC 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G&N Indicator Control Panel is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON
OPTICS POWER ON
BLOCK I SERIES 100

NOTE: The PAVM and Counter shall have been energized for at least 15 minutes immediately prior to use in this test.

3. Set switches and selectors on G&N Indicator Control Panel as follows:

SLAVE TELESCOPE to STAR LOS
Mode Selector to MANUAL
TRACKER POWER to OFF
CONTROLLER SPEED to HI
CONTROLLER MODE to DIRECT.

4. Assure that the TRACKER pushbutton is not lighted.

5. Set FREQUENCY switch on PAVB to 800 ~ No. 1

B. PROCEDURE

1. Connect the SXT Shaft MDA Input Signal to the PAVM by setting Primary Signal Selector to 203.

2. With the Optics Hand Controller in its center position, monitor PAVM to determine and record in-phase and quadrature voltage indications.

3. Connect the SXT Trunnion MDA Input signal to the PAVM by setting Primary Signal Selector to 106.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC 10711 REV A PAGE 2 OF 5

SUBSYSTEM OPTICAL

ASSY

4. With the Optics Hand Controller in its center position, monitor PAVM to determine and record in-phase and quadrature voltage indications.

5. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

6. Set COUNTER INPUT "A" or "AB" selector switch to 16.

7. Set selectors on Counter to perform E/UT of A-B for one second time base as follows:

SAMPLE TIME (N_1) to 100000
DISPLAY TIME (N_2) to 10^5
CLOCK FREQUENCY DIVIDER to 1
CLOCK SELECTOR to INT
FUNCTION to E/UT x N_1
INPUT SELECTOR to A-B
SENSE SELECTOR to FWD
DISPLAY RESET to ZERO.

8. Set CONTROLLER SPEED switch on G&N Indicator Control Panel to LOW.

9. Hold the Optics Hand Controller at the upper limit while adjusting A channel ATTEN, SLOPE, and TRIGGER switches and controls on Counter as required.

10. Hold the Optics Hand Controller at the lower limit while adjusting B channel ATTEN, SLOPE, and TRIGGER switches and controls as required.

11. Set the mode selector on the G&N Indicator Control Panel to ZERO OPTICS.

12. After the CDU 's have zeroed, set the mode selector to MANUAL.

13. Set DIGITAL RECORDER SELECTOR switch on Primary Signal Selector panel to CTR.

14. Press PRINT pushbutton on Digital Recorder to disable Printer.

15. Perform following steps in sequence:

a. Press PRINT pushbutton on Digital Recorder to enable printer.
b. Press RESET pushbutton on Counter.
c. Hold the Optics Hand Controller at its upper limit.
d. Approximately 10 seconds after performing step B.15c, release the Optics Hand Controller.
e. Press PRINT pushbutton on Digital Recorder to disable printer.

16. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.

17. Perform following steps in sequence:

a. Press PRINT pushbutton on Digital Recorder to enable printer.
b. Press RESET pushbutton on Counter.
c. Hold the Optics Hand Controller at its lower limit.
d. Approximately 10 seconds after performing step B.17c release the Optics Hand Controller.
e. Press PRINT pushbutton on Digital Recorder to disable printer.

18. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.

DATE ________

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC 10711 REV A PAGE 3 OF 5

SUBSYSTEM OPTICAL

ASSY

19. Set the mode selector on the G&N Indicator Control Panel to ZERO OPTICS.

20. Set CONTROLLER SPEED switch to MED.

21. After the CDU's have zeroed, set the mode selector to MANUAL.

22. Repeat steps B.15 through B.19.

23. Set CONTROLLER SPEED switch to HI.

24. After the CDU's have zeroed, set the mode selector to MANUAL.

25. Repeat steps B.15 through B.19.

26. Set COUNTER INPUT "A" or "AB" selector switch to 17.

27. After the CDU's have zeroed, set the mode selector on the G&N Indicator Control Panel to MANUAL.

28. Perform following steps in sequence:

a. Press PRINT pushbutton on Digital Recorder to enable printer.
b. Press RESET pushbutton on Counter.
c. Hold the Optics Hand Controller at its right limit.
d. Approximately 10 seconds after performing step B.28c, release the Optics Hand Controller.
e. Press PRINT pushbutton on Digital Recorder to disable printer.

29. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.

30. Perform following steps in sequence:

a. Press PRINT pushbutton on Digital Recorder to enable printer.
b. Press RESET pushbutton on Counter.
c. Hold the Optics Hand Controller at its left limit.
d. Approximately 10 seconds after performing step B.30c, release the Optics Hand Controller.
e. Press PRINT pushbutton on Digital Recorder to disable printer.

31. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.

32. Set the mode selector on the G&N Indicator Control Panel to ZERO OPTICS.

33. Set CONTROLLER SPEED switch to MED.

34. Repeat steps B.27 through B.32.

35. Set CONTROLLER SPEED switch to LOW.

36. Repeat steps B.27 through B.32.

37. Connect the SCT Trunnion Tachometer output signal to the PAVM by setting Primary Signal Selector to 105.

38. Press the TRACKER pushbutton on the G&N Indicator Control Panel. The pushbutton shall light.

39. Hold the Optics Hand Controller at the upper limit and monitor PAVM. to determine and record the steady state in-phase voltage indication.

DATE ________

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC 10711 REV A PAGE 4 OF 5

SUBSYSTEM OPTICAL

ASSY

40. Hold the Optics Hand Controller at the lower limit and monitor PAVM to determine and record, the steady state in-phase voltage indication.

41. Set CONTROLLER SPEED switch to MED.

42. Repeat Steps B.39 and B.40.

43. Set CONTROLLER SPEED switch to HI.

44. Repeat steps B.39 through B.41.

45. Press the TRACKER pushbutton. The pushbutton shall go out.

46. Set the mode selector to MANUAL.

47. Hold the Optics Hand Controller at the upper limit while monitoring the 2X TRUNNION CDU to determine, and record, that it is driving in the direction of increasing angles.

48. Hold the Optics Hand Controller at the right limit while monitoring the SHAFT ANGLE CDU to determine, and record, that it is driving in the direction of increasing angles.

49. Connect the Remote Optics Controller to cable W87 as shown in JDC 10734.

50. Assure that the following pushbuttons and indicators on the Remote Optics Controller are lighted:

CONTROLLER DIRECT
ZERO OPTICS
SXT DRIVE NORMAL
SCT DRIVE NORMAL

51. Assure that the following pushbuttons are not lighted:

TRACKER
TRACKER POWER

52. Set switches and controls as follows:

SLAVE TELESCOPE to STAR LOS
COARSE GAIN CONTROL to HI
FINE GAIN CONTROL fully clockwise

53. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

54. Using the SHAFT SLEW CONTROL switch and the FINE GAIN CONTROL, drive the SHAFT ANGLE CDU to 270.000 (±0.5).

55. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 20.000 (±0.5).

56. Set switches and controls as follows:

COARSE GAIN CONTROL to MED
FINE GAIN CONTROL fully clockwise

57. Press the CONTROLLER DIRECT/CONTROLLER RESOLVED pushbutton to light the CONTROLLER RESOLVED indicator.

NOTE: To determine angular excursion in steps B.58 and B.65, the background may be used as a reference. Sight through SCT eyepiece and use the scale on the numbered reticle line to establish background reference points on both sides of the reticle center.

DATE ________

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST | JDC 10711 REV A PAGE 5 OF 5

SUBSYSTEM OPTICAL | ASSY

58. Sight through SCT eyepiece and observe horizontal motion of the center of the SCT reticle pattern when the TRUNNION SLEW CONTROL switch is set to INCR. Set the TRUNNION SLEW CONTROL switch to OFF after the 2X TRUNNION CDU indication is greater than 90.000. Record the estimated maximum angular excursion of the center of the SCT reticle pattern from vertical.

59. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

60. Press the CONTROLLER DIRECT/CONTROLLER RESOLVED pushbutton to light the CONTROLLER DIRECT indicator.

61. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

62. Repeat step B.55.

63. Set switches and controls as follows:
COARSE GAIN CONTROL to MED
FINE GAIN CONTROL fully clockwise.

64. Repeat Step B.57.

65. Sight through SCT eyepiece and observe vertical motion of center of SCT reticle pattern when the SHAFT SLEW CONTROL switch is set to INCR. Set the SHAFT SLEW CONTROL switch to OFF after the 2X TRUNNION CDU indication is greater than 90.000. Record the estimated maximum angular excursion of the center of the SCT reticle pattern from horizontal.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 10711
REV. A

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.22 (B.18)	Sum of three counts of Digital Recorder	counts	874		1311		
B.25 (B.16)	Sum of three counts of Digital Recorder	counts	7864		11796		
B.25 (B.18)	Sum of three counts of Digital Recorder	counts	7864		11796		
B.29	Sum of three counts of Digital Recorder	counts	3714		5571		
B.31	Sum of three counts of Digital Recorder	counts	3714		5571		
B.34 (B.29)	Sum of three counts of Digital Recorder	counts	470		655		
B.34 (B.31)	Sum of three counts of Digital Recorder	counts	470		655		
B.36 (B.29)	Sum of three counts of Digital Recorder	counts	47		66		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 10711
REV. A
INITIAL TDRR 19950

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY
DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ________ CAL DATE
NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	Shaft control signal in-phase	mv	▨		200		
	Shaft control signal quadrature	mv	▨		▨	▨	▨
B.4	Trunnion control signal in-phase	mv	▨		200		
	Trunnion control signal quadrature	mv	▨		▨	▨	▨
B.16	Sum of three counts of Digital Recorder	counts	87		131		
B.18	Sum of three counts of Digital Recorder	counts	87		131		
B.22 (B.16)	Sum of three counts of Digital Recorder	counts	874		1311		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 10711
REV. A

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.36 (B.31)	Sum of three counts of Digital Recorder	counts	47		66		
B.39	SCT Trunnion Tachometer	volts	0.10		0.15		
B.40	SCT Trunnion Tachometer	volts	0.10		0.15		
B.42 (B.39)	SCT Trunnion Tachometer	volts	0.99		1.48		
B.42 (B.40)	SCT Trunnion Tachometer	volts	0.99		1.48		
B.44 (B.39)	SCT Trunnion Tachometer	volts	8.0		12.5		
B.44 (B.40)	SCT Trunnion Tachometer	volts	8.0		12.5		
B.47	Direction of 2X TRUNNION CDU		incr		incr		
B.48	Direction of SHAFT ANGLE CDU		incr		incr		
B.58	SCT reticle image excursion	deg	▨		±10		
B.65	SCT reticle image excursion	deg	▨		±10		

DATE ________

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC 10711 REV. B PAGE 1 OF 4

INITIAL TDRR 19950 D.S. PGS 3

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Check of maximum drive rates, minimum output voltage of Optics Hand Controller, and Resolver Mode Operation.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22223	1	3	WK	TM
B	3-10-66	27033	3,4	3	WK	WM

REFERENCES ATP 1009502, Paragraphs 3-3.11 and JDC 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G&N Indicator Control Panel is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON

OPTICS POWER ON

BLOCK I SERIES 100

NOTE: The PAVM and Counter shall have been energized for at least 15 minutes immediately prior to use in this test.

3. Set switches and selectors on G&N Indicator Control Panel as follows:

SLAVE TELESCOPE to STAR LOS

Mode Selector to MANUAL

TRACKER POWER to OFF

CONTROLLER SPEED to HI

CONTROLLER MODE to DIRECT.

4. Assure that the TRACKER pushbutton is not lighted.

5. Set FREQUENCY switch on PAVB to 800 ~ No. 1

B. PROCEDURE

1. Connect the SXT Shaft MDA Input Signal to the PAVM by setting Primary Signal Selector to 203.

2. With the Optics Hand Controller in its center position, monitor PAVM to determine and record in-phase and quadrature voltage indications.

3. Connect the SXT Trunnion MDA Input signal to the PAVM by setting Primary Signal Selector to 106.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

4. With the Optics Hand Controller in its center position, monitor PAVM to determine and record in-phase and quadrature voltage indications.

5. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

6. Set COUNTER INPUT "A" or "AB" selector switch to 16.

7. Set selectors on Counter to perform E/UT of A-B for one second time base as follows:

SAMPLE TIME (N_1) to 100000

DISPLAY TIME (N_2) to 10^5

CLOCK FREQUENCY DIVIDER to 1

CLOCK SELECTOR to INT

FUNCTION to E/UT x N_1

INPUT SELECTOR to A-B

SENSE SELECTOR to FWD

DISPLAY RESET to ZERO.

8. Set CONTROLLER SPEED switch on G&N Indicator Control Panel to LOW.

9. Hold the Optics Hand Controller at the upper limit while adjusting A channel ATTEN, SLOPE, and TRIGGER switches and controls on Counter as required.

10. Hold the Optics Hand Controller at the lower limit while adjusting B channel ATTEN, SLOPE, and TRIGGER switches and controls as required.

11. Set the mode selector on the G&N Indicator Control Panel to ZERO OPTICS.

12. After the CDU 's have zeroed, set the mode selector to MANUAL.

13. Set DIGITAL RECORDER SELECTOR switch on Primary Signal Selector panel to CTR.

14. Press PRINT pushbutton on Digital Recorder to disable Printer.

15. Perform following steps in sequence:

a. Press PRINT pushbutton on Digital Recorder to enable printer.

b. Press RESET pushbutton on Counter.

c. Hold the Optics Hand Controller at its upper limit.

d. Approximately 10 seconds after performing step B.15c, release the Optics Hand Controller.

e. Press PRINT pushbutton on Digital Recorder to disable printer.

16. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.

17. Perform following steps in sequence:

a. Press PRINT pushbutton on Digital Recorder to enable printer.

b. Press RESET pushbutton on Counter.

c. Hold the Optics Hand Controller at its lower limit.

d. Approximately 10 seconds after performing step B.17c release the Optics Hand Controller.

e. Press PRINT pushbutton on Digital Recorder to disable printer.

18. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.

---

19. Set the mode selector on the G&N Indicator Control Panel to ZERO OPTICS.

20. Set CONTROLLER SPEED switch to MED.

21. After the CDU's have zeroed, set the mode selector to MANUAL.

22. Repeat steps B.15 through B.19.

23. Set CONTROLLER SPEED switch to HI.

24. After the CDU's have zeroed, set the mode selector to MANUAL.

25. Repeat steps B.15 through B.19.

26. Set COUNTER INPUT "A" or "AB" selector switch to 17.

27. After the CDU's have zeroed, set the mode selector on the G&N Indicator Control Panel to MANUAL.

28. Perform following steps in sequence:

a. Press PRINT pushbutton on Digital Recorder to enable printer.

b. Press RESET pushbutton on Counter.

c. Hold the Optics Hand Controller at its right limit.

d. Approximately 10 seconds after performing step B.28c, release the Optics Hand Controller.

e. Press PRINT pushbutton on Digital Recorder to disable printer.

29. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.

30. Perform following steps in sequence:

a. Press PRINT pushbutton on Digital Recorder to enable printer.

b. Press RESET pushbutton on Counter.

c. Hold the Optics Hand Controller at its left limit.

d. Approximately 10 seconds after performing step B.30c, release the Optics Hand Controller.

e. Press PRINT pushbutton on Digital Recorder to disable printer.

31. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.

32. Set the mode selector on the G&N Indicator Control Panel to ZERO OPTICS.

33. Set CONTROLLER SPEED switch to MED.

34. Repeat steps B.27 through B.32.

35. Set CONTROLLER SPEED switch to LOW.

36. Repeat steps B.27 through B.32.

37. Connect the Remote Optics Controller to cable W87 as shown in JDC 10734.

38. Assure that the following pushbuttons and indicators on the Remote Optics Controller are lighted:

CONTROLLER DIRECT

ZERO OPTICS

SXT DRIVE NORMAL

SCT DRIVE NORMAL

---

39. Assure that the following pushbuttons are not lighted:

TRACKER

TRACKER POWER

40. Set switches and controls as follows:

SLAVE TELESCOPE to STAR LOS

COARSE GAIN CONTROL to HI

FINE GAIN CONTROL fully clockwise

41. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

42. Using the SHAFT SLEW CONTROL switch and the FINE GAIN CONTROL, drive the SHAFT ANGLE CDU to 270.000 (±0.5).

43. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 20.000 (±0.5).

44. Set switches and controls as follows:

COARSE GAIN CONTROL to MED

FINE GAIN CONTROL fully clockwise

45. Press the CONTROLLER DIRECT/CONTROLLER RESOLVED pushbutton to light the CONTROLLER RESOLVED indicator.

NOTE: To determine angular excursion in steps B.46 and B.53, the background may be used as a reference. Sight through SCT eyepiece and use the scale on the numbered reticle line to establish background reference points on both sides of the reticle center.

46. Sight through SCT eyepiece and observe horizontal motion of the center of the SCT reticle pattern when the TRUNNION SLEW CONTROL switch is set to INCR. Set the TRUNNION SLEW CONTROL switch to OFF after the 2X TRUNNION CDU indication is greater than 90.000. Record the estimated maximum angular excursion of the center of the SCT reticle pattern from vertical.

47. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

48. Press the CONTROLLER DIRECT/CONTROLLER RESOLVED pushbutton to light the CONTROLLER DIRECT indicator.

49. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

50. Repeat step B.43.

51. Set switches and controls as follows:

COARSE GAIN CONTROL to MED

FINE GAIN CONTROL fully clockwise.

52. Repeat Step B.45.

53. Sight through SCT eyepiece and observe vertical motion of center of SCT reticle pattern when the SHAFT SLEW CONTROL switch is set to INCR. Set the SHAFT SLEW CONTROL switch to OFF after the 2X TRUNNION CDU indication is greater than 90.000. Record the estimated maximum angular excursion of the center of the SCT reticle pattern from horizontal.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 10711
REV. B
INITIAL TDRR 19950

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	Shaft control signal in-phase	mv	▨		200		
	Shaft control signal quadrature	mv	▨		▨	▨	▨
B.4	Trunnion control signal in-phase	mv	▨		200		
	Trunnion control signal quadrature	mv	▨		▨	▨	▨
B.16	Sum of three counts of Digital Recorder	counts	87		131		
B.18	Sum of three counts of Digital Recorder	counts	87		131		
B.22 (B.16)	Sum of three counts of Digital Recorder	counts	874		1311		

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 10711
REV. B

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.22 (B.18)	Sum of three counts of Digital Recorder	counts	874		1311		
B.25 (B.16)	Sum of three counts of Digital Recorder	counts	7864		11796		
B.25 (B.18)	Sum of three counts of Digital Recorder	counts	7864		11796		
B.29	Sum of three counts of Digital Recorder	counts	3714		5571		
B.31	Sum of three counts of Digital Recorder	counts	3714		5571		
B.34 (B.29)	Sum of three counts of Digital Recorder	counts	470		655		
B.34 (B.31)	Sum of three counts of Digital Recorder	counts	470		655		
B.36 (B.29)	Sum of three counts of Digital Recorder	counts	47		66		

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 10711
REV. B

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.36 (B.31)	Sum of three counts of Digital Recorder	counts	47		66		
B.46	SCT reticle image excursion	deg	▨		±10		
B.53	SCT reticle image excursion	deg	▨		±10		

DATE 11 JUN 65

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST
JDC 10711 REV. ____ PAGE 1 OF 4
INITIAL TDRR 19950 D.S. PGS 3
SUBSYSTEM OPTICAL
ASSY.

DESCRIPTION

Check of maximum drive rates, minimum output voltage of Optics Hand Controller, and Resolver Mode Operation.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ATP 1009502, Paragraphs 3-3.11 and JDC 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G&N Indicator Contorl Panel is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:
    OIA ON/ISS POWER DISABLED
    OPTICS POWER ON
    BLOCK I SERIES 100
        Note: The PAVM and Counter shall have been energized for at least 15 minutes immediately prior to use in this test.
3. Set switches and selectors on G&N Indicator Control Panel as follows:
    SLAVE TELESCOPE to STAR LOS
    Mode Selector to MANUAL
    TRACKER POWER to OFF
    CONTROLLER SPEED to HI
    CONTROLLER MODE to DIRECT.
4. Assure that the TRACKER pushbutton is not lighted.
5. Set FREQUENCY switch on PAVM to 800~No.1.

B. PROCEDURE

1. Connect the SXT Shaft MDA Input signal to the PAVM by setting Primary Signal Selector to 203.
2. With the Optics Hand Controller in its center position, monitor PAVM to determine and record in-phase and quadrature voltage indications.
3. Connect the SXT Trunnion MDA Input signal to the PAVM by setting Primary Signal Selector to 106.
4. With the Optics Hand Controller in its center position, monitor PAVM to determine and record in-phase and quadrature voltage indications.
5. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.
6. Set COUNTER INPUT "A" or "AB" selector switch to 16.
7. Set selectors on Counter to perform E/UT of A-B for one second time base as follows:
    SAMPLE TIME (N_1) to 10000
    DISPLAY TIME (N_2) to 10^5

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ______

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST
JDC 10711 REV PAGE 2 OF 4
SUBSYSTEM OPTICAL
ASSY

    CLOCK FREQUENCY DIVIDER to 1
    CLOCK SELECTOR to INT
    FUNCTION to E/UT x N_1
    INPUT SELECTOR to A-B
    SENSE SELECTOR to FWD
    DISPLAY RESET to ZERO

8. Set CONTROLLER SPEED switch on G&N Indicator Control Panel to LOW.
9. Hold the Optics Hand Controller at the upper limit while adjusting A channel ATTEN, SLOPE, and TRIGGER switches and controls on Counter as required.
10. Hold the Optics Hand Controller at the lower limit while adjusting B channel ATTEN, SLOPE, and TRIGGER switches and controls as required.
11. Set the mode selector on the G&N Indicator Control Panel to ZERO OPTICS.
12. After the CDU's have zeroed, set the mode selector to MANUAL.
13. Set DIGITAL RECORDER SELECTOR switch on Primary Signal Selector panel to CTR.
14. Press PRINT pushbutton on Digital Recorder to disable Printer.
15. Perform following steps in sequence:
    a. Press PRINT pushbutton on Digital Recorder to enable printer.
    b. Press RESET pushbutton on Counter.
    c. Hold the Optics Hand Controller at its upper limit.
    d. Approximately 10 seconds after performing step B.15c, release the Optics Hand Controller.
    e. Press PRINT pushbutton on Digital Recorder to disable printer.
16. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.
17. Perform following steps in sequence:
    a. Press PRINT pushbutton on Digital Recorder to enable printer.
    b. Press RESET pushbutton on Counter.
    c. Hold the Optics Hand Controller at its lower limit.
    d. Approximately 10 seconds after performing step B.17c release the Optics Hand Controller.
    e. Press PRINT pushbutton on Digital Recorder to disable printer.
18. Select the three consecutive prinouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.
19. Set the mode selector on the G&N Indicator Control Panel to ZERO OPTICS.
20. Set CONTROLLER SPEED switch to MED.
21. After the CDU's have zeroed, set the mode selector to MANUAL.
22. Repeat steps B.15 through B.19.
23. Set CONTROLLER SPEED switch to HI.
24. After the CDU's have zeroed, set the mode selector to MANUAL.
25. Repeat steps B.15 through B.19.
26. Set COUNTER INPUT "A" or "AB" selector switch to 17.
27. After the CDU's have zeroed, set the mode selector on the G&N Indicator Control Panel to MANUAL.
28. Perform following steps in sequence:
    a. Press PRINT pushbutton on Digital Recorder to enable printer.
    b. Press RESET pushbutton on Counter.
    c. Hold the Optics Hand Controller at its right limit.
    d. Approximately 10 seconds after performing step B.28c, release the Optics Hand Controller.
    e. Press PRINT pushbutton on Digital Recorder to disable printer.
29. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.
30. Perform following steps in sequence:
    a. Press PRINT pushbutton on Digital Recorder to enable printer.
    b. Press RESET pushbutton on Counter.
    c. Hold the Optics Hand Controller at its left limit.
    d. Approximately 10 seconds after performing step B.30c, release the Optics Hand Controller.
    e. Press PRINT pushbutton on Digital Recorder to disable printer.

DATE ______

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST
JDC 10711 REV PAGE 3 OF 4
SUBSYSTEM OPTICAL
ASSY

31. Select the three consecutive printouts on Digital Recorder the values of which are most nearly equal and record the sum of the three selected printouts.
32. Set the mode selector on the G&N Indicator Control Panel to ZERO OPTICS.
33. Set CONTROLLER SPEED switch to MED.
34. Repeat steps B.27 through B.32.
35. Set CONTROLLER SPEED switch to LOW.
36. Repeat steps B.27 through B.32.
37. Connect the SCT Trunnion Tachometer output signal to the PAVM by setting Primary Signal Selector to 105.
38. Press the TRACKER pushbutton on the G&N Indicator Control Panel. The pushbutton shall light.
39. Hold the Optics Hand Controller at the upper limit and monitor PAVM, to determine and record the steady state in-phase voltage indication.
40. Hold the Optics Hand Controller at the lower limit and monitor PAVM to determine, and record, the steady state in-phase voltage indication.
41. Set CONTROLLER SPEED switch to MED.
42. Repeat Steps B.39 and B.40.
43. Set CONTROLLER SPEED switch to HI.
44. Repeat steps B.39 through B.41.
45. Press the TRACKER pushbutton, The pushbutton shall go out.
46. Set the mode selector to MANUAL.
47. Hold the Optics Hand Controller at the upper limit while monitoring the 2X TRUNNION CDU to determine, and record, that it is driving in the direction of increasing angles.
48. Hold the Optics Hand Controller at the right limit while monitoring the SHAFT ANGLE CDU to determine, and record, that it is driving in the direction of increasing angles.
49. Connect the Remote Optics Controller to cable W87 as shown in JDC 10734.
50. Assure that the following pushbuttons and indicators on the Remote Optics Controller are lighted:
    CONTROLLER DIRECT
    ZERO OPTICS
    SXT DRIVE NORMAL
    SCT DRIVE NORMAL
51. Assure that the following pushbuttons are not lighted:
    TRACKER
    TRACKER POWER
52. Set switches and controls as follows:
    SLAVE TELESCOPE to STAR LOS
    COARSE GAIN CONTROL to HI
    FINE GAIN CONTROL fully clockwise
53. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.
54. Using the SHAFT SLEW CONTROL switch and the FINE GAIN CONTROL, drive the SHAFT ANGLE CDU to 270.000 (±0.5).
55. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 20.000 (±0.5).
56. Set switches and controls as follows:
    COARSE GAIN CONTROL to MED
    FINE GAIN CONTROL fully clockwise
57. Press the CONTROLLER DIRECT/CONTROLLER RESOLVED pushbutton to light the CONTROLLER RESOLVED indicator.
        Note: To determine angular excursion in steps B.58 and B.65, the background may be used as a reference. Sight through SCT eyepiece and use the scale on the numbered reticle line to establish background reference points on both sides of the reticle center.

DATE ______

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST
JDC 10711 REV PAGE 4 OF 4
SUBSYSTEM OPTICAL
ASSY

58. Sight through SCT eyepiece and observe horizontal motion of the center of the SCT reticle pattern when the TRUNNION SLEW CONTROL switch is set to INCR. Set the TRUNNION SLEW CONTROL switch to OFF after the 2X TRUNNION CDU indication is greater than 90.000 . Record the estimated maximum angular excursion of the center of the SCT reticle pattern from vertical.
59. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.
60. Press the CONTROLLER DIRECT/CONTROLLER RESOLVED pushbutton to light the CONTROLLER DIRECT indicator.
61. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.
62. Repeat step B.55.
63. Set switches and controls as follows:
    COARSE GAIN CONTROL to MED
    FINE GAIN CONTROL fully clockwise.
64. Repeat Step B.57.
65. Sight through SCT eyepiece and observe vertical motion of center of SCT reticle pattern when the SHAFT SLEW CONTROL switch is set to INCR. Set the SHAFT SLEW CONTROL switch to OFF after the 2X TRUNNION CDU indication is greater than 90.000 . Record the estimated maximum angular excursion of the center of the SCT reticle pattern from horizontal.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 3

NO. 1071 DC
REV. ____
INITIAL TIRR 19950

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ **DWG** ____ **REV.** ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ **SER. NO.** ____ CAL DATE
NAME ____ **SER. NO.** ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION **APPROVED BY** ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	Shaft control signal in-phase	mv	▨		200		
	Shaft control signal quadrature	mv	▨		▨	▨	▨
B.4	Trunnion control signal in-phase	mv	▨		200		
	Trunnion control signal quadrature	mv	▨		▨	▨	▨
B.16	Sum of three counts of Digital Recorder	counts	87		131		
B.18	Sum of three counts of Digital Recorder	counts	87		131		
B.22 (B.16)	Sum of three counts of Digital Recorder	counts	874		1311		

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 3

JDC
NO. 10711
REV. ____

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.22 (B.18)	Sum of three counts of Digital Recorder	counts	874		1311		
B.25 (B.16)	Sum of three counts of Digital Recorder	counts	7864		11796		
B.25 (B.18)	Sum of three counts of Digital Recorder	counts	7864		11796		
B.29	Sum of three counts of Digital Recorder	counts	3714		5571		
B.31	Sum of three counts of Digital Recorder	counts	3714		5571		
B.34 (B.29)	Sum of three counts of Digital Recorder	counts	470		655		
B.34 (B.31)	Sum of three counts of Digital Recorder	counts	470		655		
B.36 (B.29)	Sum of three counts of Digital Recorder	counts	47		66		
B.36 (B.31)	Sum of three counts of Digital Recorder	counts	47		66		

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 3

JDC
NO. 10711
REV. ____

JOB MAXIMUM DRIVE RATES AND RESOLVED MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.39	SCT Trunnion Tachometer	volts	0.09		0.13		
B.40	SCT Trunnion Tachometer	volts	0.09		0.13		
B.42 (B.39)	SCT Trunnion Tachometer	volts	0.87		1.31		
B.42 (B.40)	SCT Trunnion Tachometer	volts	0.87		1.31		
B.44 (B.39)	SCT Trunnion Tachometer	volts	7.92		11.88		
B.44 (B.40)	SCT Trunnion Tachometer	volts	7.92		11.88		
B.47	Direction of 2X TRUNNION CDU		incr		incr		
B.48	Direction of SHAFT ANGLE CDU		incr		incr		
B.58	SCT reticle image excursion	deg	▨		±10		
B.65	SCT reticle image excursion	deg	▨		±10		

DATE ____

Released with ATP 1009502

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 REV. A PAGE 1 OF 3
INITIAL TDRR 19950 D.S. PGS 3

SUBSYSTEM OPTICAL
ASSY.
DESCRIPTION Check of trunnion and shaft encoder pulse characteristics.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22224	1	-	WK	TM

REFERENCES ATP 1009502, Paragraphs 3-3.14.1 through 3-3.14.4. JDC's 18009, 18041, and 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

   OIA ON
   OPTICS POWER ON
   BLOCK I SERIES 100.

   NOTE: Assure that the Dual Beam Oscilloscope and PAVM have been energized at least 15 minutes immediately prior to use in this test.

3. Assure that the following indicators on the Remote Optics Controller are lighted:

   MANUAL
   CONTROLLER DIRECT
   SXT DRIVE DISABLED
   SCT DRIVE NORMAL.

4. Assure that the following pushbuttons are not lighted:

   TRACKER
   TRACKER POWER.

5. Set switches as follows:

   SLAVE TELESCOPE to STAR LOS
   COARSE GAIN CONTROL to LOW
   SHAFT SLEW CONTROL to OFF
   TRUNNION SLEW CONTROL to OFF.

6. Connect the SXT Trunnion MDA Input to the PAVM by setting the Primary Signal Selector to 106.

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ______

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 REV A PAGE 2 OF 3

SUBSYSTEM OPTICAL
ASSY

7. Set FREQUENCY switch on PAVM to 800~ No. 1.

8. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to INCR and adjust the FINE GAIN CONTROL until the PAVM indicates 0.117 (±0.050) volts, 0 phase.

9. Set TRUNNION SLEW CONTROL switch to OFF.

10. Connect the 2X TRUNNION CDU encoder +Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J21 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

11. Set the TRIGGER switch on Dual Beam Oscilloscope to EXT.

12. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.

13. Press the MANUAL/ZERO OPTICS pushbutton to light the ZERO OPTICS indicator.

14. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

B. PROCEDURE

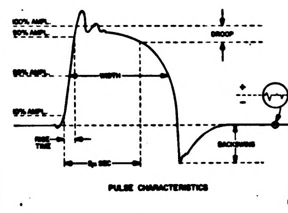
1. Set the TRUNNION SLEW CONTROL switch to INCR.

   NOTE: Multiply value obtained for amplitude, backswing, and noise in step B.2 by 4.5 before recording on data sheet. See illustration for definition of pulse characteristics.

2. Synchronize output pulses on Dual Beam Oscilloscope. Record the following pulse characteristics:

   polarity
   amplitude - (volts)
   droop
   width - (at 50% amplitude)
   rise time - (10% - 90% amplitude)
   backswing
   noise level - (volts)

See illustration for definition of pulse characteristics.



Pulse Characteristics

DATE ______

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 REV A PAGE 3 OF 3

SUBSYSTEM OPTICAL
ASSY

3. Set the TRUNNION SLEW CONTROL switch to OFF.

4. Connect the 2X TRUNNION CDU encoder -Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J22 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

5. Set the TRUNNION SLEW CONTROL switch to DECR.

6. Repeat steps B.2 and B.3.

7. Connect the SHAFT ANGLE CDU encoder +Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J23 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

8. Set the SHAFT SLEW CONTROL switch to INCR.

9. Repeat step B.2.

10. Set SHAFT SLEW CONTROL switch to OFF.

11. Connect the SHAFT ANGLE CDU encoder -Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J24 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

12. Set the SHAFT SLEW CONTROL switch to DECR.

13. Repeat steps B.2 and B.10.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 10712 JDC
REV. A
INITIAL TDRR 19950

JOB CDU ENCODER PULSE CHARACTERISTICS

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.6 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 **OF** 3

JDC
NO. 10712
REV. A

JOB CDU ENCODER PULSE CHARACTERISTICS

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.6 (B.2) (cont)	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.9 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.13 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 **OF** 3

JDC
NO. 10712
REV. A

JOB CDU ENCODER PULSE CHARACTERISTICS

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.13 (B.2) (cont)	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		

DATE ______

Released with ATP 1009502

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 REV. B PAGE 1 OF 3

INITIAL TDRR 19950 D.S. PGS 3

SUBSYSTEM OPTICAL.

ASSY.

DESCRIPTION Check of trunnion and shaft encoder pulse characteristics.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22224	1	-	WK	TM
B	2-1-66	25870	2	-	WK	-

REFERENCES ATP 1009502, Paragraphs 3-3.14.1 through 3-3.14.4. JDC's 18009, 18041, and 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:
   - OIA ON
   - OPTICS POWER ON
   - BLOCK I SERIES 100.

   NOTE: Assure that the Dual Beam Oscilloscope and PAVM have been energized at least 15 minutes immediately prior to use in this test.

3. Assure that the following indicators on the Remote Optics Controller are lighted:
   - MANUAL
   - CONTROLLER DIRECT
   - SXT DRIVE DISABLED
   - SCT DRIVE NORMAL.

4. Assure that the following pushbuttons are not lighted:
   - TRACKER
   - TRACKER POWER.

5. Set switches as follows:
   - SLAVE TELESCOPE to STAR LOS
   - COARSE GAIN CONTROL to LOW
   - SHAFT SLEW CONTROL to OFF
   - TRUNNION SLEW CONTROL to OFF.

6. Connect the SXT Trunnion MDA Input to the PAVM by setting the Primary Signal Selector to 106.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 11 JUN 65

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 REV B PAGE 2 OF 3

SUBSYSTEM OPTICAL

ASSY

7. Set FREQUENCY switch on PAVM to 800~ No. 1.

8. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to INCR and adjust the FINE GAIN CONTROL until the PAVM indicates 0.117 (±0.050) volts.

9. Set TRUNNION SLEW CONTROL switch to OFF.

10. Connect the 2X TRUNNION CDU encoder +Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J21 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

11. Set the TRIGGER switch on Dual Beam Oscilloscope to EXT.

12. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.

13. Press the MANUAL/ZERO OPTICS pushbutton to light the ZERO OPTICS indicator.

14. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

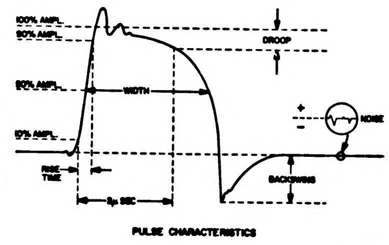
B. PROCEDURE

1. Set the TRUNNION SLEW CONTROL switch to INCR.

NOTE: Multiply value obtained for amplitude, backswing, and noise in step B.2 by 4.5 before recording on data sheet. See illustration for definition of pulse characteristics.

2. Synchronize output pulses on Dual Beam Oscilloscope. Record the following pulse characteristics:
   - polarity
   - amplitude - (volts)
   - droop
   - width - (at 50% amplitude)
   - rise time - (10% - 90% amplitude)
   - backswing
   - noise level - (volts)

See illustration for definition of pulse characteristics.



Pulse Characteristics

DATE 11 JUN 65

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 REV B PAGE 3 OF 3

SUBSYSTEM OPTICAL

ASSY

3. Set the TRUNNION SLEW CONTROL switch to OFF.

4. Connect the 2X TRUNNION CDU encoder -Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J22 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

5. Set the TRUNNION SLEW CONTROL switch to DECR.

6. Repeat steps B.2 and B.3.

7. Connect the SHAFT ANGLE CDU encoder +Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J23 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

8. Set the SHAFT SLEW CONTROL switch to INCR.

9. Repeat step B.2.

10. Set SHAFT SLEW CONTROL switch to OFF.

11. Connect the SHAFT ANGLE CDU encoder -Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J24 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

12. Set the SHAFT SLEW CONTROL switch to DECR.

13. Repeat steps B.2 and B.10.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 10712 JDC
REV. B
INITIAL TDRR 19950

JOB CDU ENCODER PULSE CHARACTERISTICS

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE

NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.6 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		

DATE 11 JUN 65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 **OF** 3

JDC
NO. 10712
REV. B

JOB CDU ENCODER PULSE CHARACTERISTICS

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.6 (B.2) (cont)	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.9 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.13 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 **OF** 3

JDC
NO. 10712
REV. B

JOB CDU ENCODER PULSE CHARACTERISTICS

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.13 (B.2) (cont)	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		

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Released with ATP 1009502

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 REV. C PAGE 1 OF 3

INITIAL TDRR 19950 D.S. PGS 3

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Check of trunnion and shaft encoder pulse characteristics.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
(M) A	9-1-65	22224	1	-	WK	TM
B	2-1-66	25870	2	-	WK	-
C	9-15-66	31048	2, 3	-	EA	-

REFERENCES ATP 1009502, Paragraphs 3-3.14.1 through 3-3.14.4. JDC's 18009, 18041, and 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:
   - OIA ON
   - OPTICS POWER ON
   - BLOCK I SERIES 100.

   NOTE: Assure that the Dual Beam Oscilloscope and PAVM have been energized at least 15 minutes immediately prior to use in this test.

3. Assure that the following indicators on the Remote Optics Controller are lighted:
   - MANUAL
   - CONTROLLER DIRECT
   - SXT DRIVE DISABLED
   - SCT DRIVE NORMAL.

4. Assure that the following pushbuttons are not lighted:
   - TRACKER
   - TRACKER POWER.

5. Set switches as follows:
   - SLAVE TELESCOPE to STAR LOS
   - COARSE GAIN CONTROL to LOW
   - SHAFT SLEW CONTROL to OFF
   - TRUNNION SLEW CONTROL to OFF.

6. Connect the SXT Trunnion MDA Input to the PAVM by setting the Primary Signal Selector to 106.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 11 JUN 65

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 REV C PAGE 2 OF 3

SUBSYSTEM OPTICAL

ASSY

7. Set FREQUENCY switch on PAVM to 800~ No. 1.

8. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to INCR and adjust the FINE GAIN CONTROL until the PAVM indicates 0.117 (±0.050) volts.

9. Set TRUNNION SLEW CONTROL switch to OFF.

10. Connect the 2X TRUNNION CDU encoder +Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers either on Coaxial Distribution Panel from jack J21 to jack J25 and from Jack J26 to jack J13 or on Auxiliary Input Panel from jack J3C to jack J1K and from Jack J1M to jack J1A.

11. Set the TRIGGER switch on Dual Beam Oscilloscope to EXT.

12. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.

13. Press the MANUAL/ZERO OPTICS pushbutton to light the ZERO OPTICS indicator.

14. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

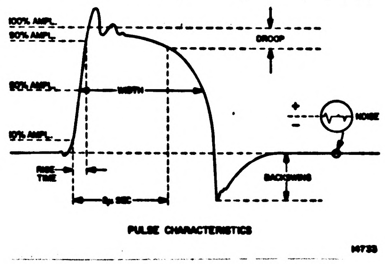
B. PROCEDURE

1. Set the TRUNNION SLEW CONTROL switch to INCR.

NOTE: Multiply value obtained for amplitude, backswing, and noise in step B.2 by 4.5 before recording on data sheet. See illustration for definition of pulse characteristics.

2. Synchronize output pulses on Dual Beam Oscilloscope. Record the following pulse characteristics:
   - polarity
   - amplitude - (volts)
   - droop
   - width - (at 50% amplitude)
   - rise time - (10% - 90% amplitude)
   - backswing
   - noise level - (volts)

See illustration for definition of pulse characteristics.



Pulse Characteristics

DATE 11 JUN 65

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 REV C PAGE 3 OF 3

SUBSYSTEM OPTICAL

ASSY

3. Set the TRUNNION SLEW CONTROL switch to OFF.

4. Connect the 2X TRUNNION CDU encoder -Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers either on Coaxial Distribution Panel from jack J22 to jack J25 and from jack J26 to jack J13 or on Auxiliary Input Panel from jack J3D to jack J1K and from jack J1M to jack J1A.

5. Set the TRUNNION SLEW CONTROL switch to DECR.

6. Repeat steps B.2 and B.3.

7. Connect the SHAFT ANGLE CDU encoder +Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers either on Coaxial Distribution Panel from jack J23 to jack J25 and from jack J26 to jack J13 or on Auxiliary Input Panel from jack J3A to jack J1K and from jack J1M to jack J1A.

8. Set the SHAFT SLEW CONTROL switch to INCR.

9. Repeat step B.2.

10. Set SHAFT SLEW CONTROL switch to OFF.

11. Connect the SHAFT ANGLE CDU encoder -Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers either on Coaxial Distribution Panel from jack J24 to jack J25 and from jack J26 to jack J13 or on Auxiliary Input Panel from jack J3B to jack J1K and from jack J1M to J1A.

12. Set the SHAFT SLEW CONTROL switch to DECR.

13. Repeat steps B.2 and B.10.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 10712 JDC
REV. C
INITIAL TDRR 19950

JOB CDU ENCODER PULSE CHARACTERISTICS

ASSEMBLY UNDER TEST

TITLE

SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μsec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.6 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 3

JDC
NO. 10712
REV. C

JOB CDU ENCODER PULSE CHARACTERISTICS

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.6 (B.2) (cont)	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.9 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.13 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 3

JDC
NO. 10712
REV. C

JOB CDU ENCODER PULSE CHARACTERISTICS

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.13 (B.2) (cont)	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		

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Released with ATP 1009502

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 **REV.** ____ **PAGE** 1 **OF** 3

INITIAL TDRR 19950 **D.S. PGS** 3

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Check of trunnion and shaft encoder pulse characteristics.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ATP 1009502, Paragraphs 3-3.14.1 through 3-3.14.4. JDC's 18009, 18041, and 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON/ISS POWER DISABLED
OPTICS POWER ON
BLOCK I SERIES 100.

NOTE: Assure that the Dual Beam Oscilloscope and PAVM have been energized at least 15 minutes immediately prior to use in this test.

3. Assure that the following indicators on the Remote Optics Controller are lighted:

MANUAL
CONTROLLER DIRECT
SXT DRIVE DISABLED
SCT DRIVE NORMAL.

4. Assure that the following pushbuttons are not lighted:

TRACKER
TRACKER POWER.

5. Set switches as follows:

SLAVE TELESCOPE to STAR LOS
COARSE GAIN CONTROL to LOW
SHAFT SLEW CONTROL to OFF
TRUNNION SLEW CONTROL to OFF.

6. Connect the SXT Trunnion MDA Input to the PAVM by setting the Primary Signal Selector to 106.

VERIFICATION WITH SIDL REQUIRED BEFORE USE **DATE** ______

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 **REV** **PAGE** 2 **OF** 3

SUBSYSTEM OPTICAL

ASSY

7. Set FREQUENCY switch on PAVM to 800~ No. 1.

8. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to INCR and adjust the FINE GAIN CONTROL until the PAVM indicates 0.117 (±0.050) volts, 0 phase.

9. Set TRUNNION SLEW CONTROL switch to OFF.

10. Connect the 2X TRUNNION CDU encoder +Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J21 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

11. Set the TRIGGER switch on Dual Beam Oscilloscope to EXT.

12. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.

13. Press the MANUAL/ZERO OPTICS pushbutton to light the ZERO OPTICS indicator.

14. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

B. PROCEDURE

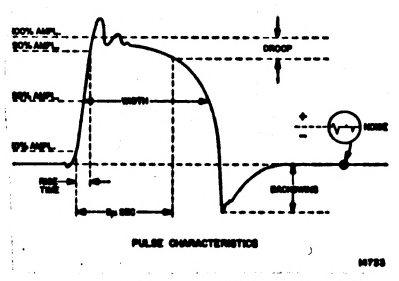
1. Set the TRUNNION SLEW CONTROL switch to INCR.

NOTE: Multiply value obtained for amplitude, backswing, and noise in step B.2 by 4.5 before recording on data sheet. See illustration for definition of pulse characteristics.

2. Synchronize output pulses on Dual Beam Oscilloscope. Record the following pulse characteristics:

polarity
amplitude - (volts)
droop
width - (at 50% amplitude)
rise time - (10% - 90% amplitude)
backswing
noise level - (volts)

See illustration for definition of pulse characteristics.



Pulse Characteristics

DATE ______

JOB CDU ENCODER PULSE CHARACTERISTICS TEST

JDC 10712 **REV** **PAGE** 3 **OF** 3

SUBSYSTEM OPTICAL

ASSY

3. Set the TRUNNION SLEW CONTROL switch to OFF.

4. Connect the 2X TRUNNION CDU encoder -Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J22 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

5. Set the TRUNNION SLEW CONTROL switch to DECR.

6. Repeat steps B.2 and B.3.

7. Connect the SHAFT ANGLE CDU encoder +Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J23 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

8. Set the SHAFT SLEW CONTROL switch to INCR.

9. Repeat step B.2.

10. Set SHAFT SLEW CONTROL switch to OFF.

11. Connect the SHAFT ANGLE CDU encoder -Δθ output to Channel B1 of Dual Beam Oscilloscope by connecting jumpers from jack J24 to jack J25 on Coaxial Distribution Panel and from jack J26 to jack J13.

12. Set the SHAFT SLEW CONTROL switch to DECR.

13. Repeat steps B.2 and B.10.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 10712
REV. ______
INITIAL TDRR 19950

JOB CDU ENCODER PULSE CHARACTERISTICS.

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.6 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 10712
REV. ____

JOB CDU ENCODER PULSE CHARACTERISTICS

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.6 (B.2) (cont)	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.9 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		
	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		
B.13 (B.2)	Polarity	▨	pos		pos		
	Amplitude	volts	4		10		
	Droop (at 2 μ sec)	% ampl	▨		20%		
	Width (50% ampl)	μ sec	2		6		

DATE ________

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 10712
REV. ____

JOB CDU ENCODER PULSE CHARACTERISTICS

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.13 (B.2) (cont)	Rise time (10% - 90% ampl)	μ sec	▨		0.5		
	Backswing	volts	▨		4		
	Noise positive peak	volts	▨		+0.4		
	Noise negative peak	volts	▨		-4.0		

DATE ________

Released with ATP 1009502

JOB TIME TO ZERO TEST

JDC 10713 **REV.** A **PAGE** 1 **OF** 3

INITIAL TDRR 19950 **D.S. PGS** 2

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION The ability of the Optical Subsystem to zero within a specified period of time is checked. The ZERO OPTICS readout requirements of the CDU's are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22225	1	1,2	WK	TM

REFERENCES ATP 1009502, Paragraphs 3-3.13.1, 3-3.13.2, 3-3.3.1, 3-3.3.2

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted.

   OIA ON

   OPTICS POWER ON

   BLOCK I SERIES 100.

   NOTE: Assure that the Oscillograph Console has been energized a minimum of 15 minutes immediately prior to use in this test.

3. Assure that the following pushbuttons and indicators on the Remote Optics Controller are lighted:

   SXT DRIVE NORMAL

   ZERO OPTICS

   SCT DRIVE NORMAL

   CONTROLLER DIRECT.

4. Assure that the following pushbuttons are not lighted:

   TRACKER

   TRACKER POWER.

5. Set switches and controls as follows:

   SHAFT SLEW CONTROL to OFF

   SLAVE TELESCOPE to STAR LOS

   TRUNNION SLEW CONTROL to OFF

   COARSE GAIN CONTROL to HI

   FINE GAIN CONTROL fully clockwise.

6. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton on the

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ______

JOB TIME TO ZERO TEST

JDC 10713 **REV** A **PAGE** 2 **OF** 3

SUBSYSTEM OPTICAL

ASSY

Remote Optics Controller to light the MANUAL indicator.

B. PROCEDURE

1. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU in the direction of increasing angles to 180.000 (±5)°.

2. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

3. Set switches on Oscillograph Signal Selector panel as follows:

   a. CHANNEL 1 to 11 (2X TRUNNION CDU 16X resolver error)

   b. CHANNEL 2 to 12 (SXT TRUNNION Tachometer)

   c. CHANNEL 3 to 11 (2X TRUNNION CDU Tachometer)

   d. CHANNEL 4 to 12 (SCT TRUNNION 1X resolver error)

   e. CHANNEL 5 to 8 (SXT TRUNNION MDA output)

   f. CHANNEL 6 to 5 (SCT TRUNNION MDA output).

4. Assure that the following indicators are lighted:

   800~ 0 PH REFERENCE

   CH 3 AC

   CH 4 AC

   CH 5 AC

   CH 6 AC.

5. Set CHART DRIVE switch to MM/SEC.

6. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

7. After the 2X TRUNNION CDU has stopped, monitor and record the dial indication.

8. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

9. Monitor oscillograph chart CHANNEL 1 to determine and record the time for the 2X TRUNNION CDU 16X resolver error to reach steady-state.

10. Monitor oscillograph chart CHANNEL 4 to determine and record the time for the SCT Trunnion 1X resolver error to reach steady-state.

11. Monitor oscillograph chart CHANNEL 5 to determine and record the time for the SXT Trunnion MDA output to reach steady-state.

12. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

13. Using the SHAFT SLEW CONTROL switch and the FINE GAIN CONTROL, drive the SHAFT ANGLE CDU in the direction of increasing angles to 180.000 (±5)°.

14. Set switches on Oscillograph Signal Selector panel as follows:

   a. CHANNEL 1 to 8 (SXT SHAFT MDA output)

DATE ______

JOB TIME TO ZERO TEST

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SUBSYSTEM OPTICAL

ASSY

   b. CHANNEL 2 to 11 (SCT SHAFT Tachometer)

   c. CHANNEL 3 to 13 (SHAFT ANGLE CDU Tachometer)

   d. CHANNEL 4 to 13 (SCT SHAFT 1X resolver error)

   e. CHANNEL 5 to 10 (SHAFT ANGLE CDU 16X resolver error)

   f. CHANNEL 6 to 10 (SXT SHAFT Tachometer).

15. Assure that the following indicators are lighted:

   800 ~ 0 PH REFERENCE

   CH 3 AC

   CH 4 AC

   CH 5 AC

   CH 6 AC.

16. Set CHART DRIVE switch to MM/SEC.

17. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

18. After the SHAFT ANGLE CDU has stopped, monitor and record the dial indication.

19. Set CHART DRIVE switch on Oscillograph Control panel to OFF.

20. Monitor oscillograph chart CHANNEL 1 to determine and record the time for the SXT Shaft MDA output to reach steady-state.

21. Monitor oscillograph chart CHANNEL 4 to determine and record the time for the SCT Shaft 1X resolver error to reach steady-state.

22. Monitor oscillograph chart CHANNEL 5 to determine and record the time for the SHAFT ANGLE CDU 16X resolver error to reach steady-state.

DATE ______

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EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 10713
REV. A
INITIAL TDRR 19950

JOB TIME TO ZERO TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.7	2X TRUNNION CDU	deg	359.994		0.006		
B.9	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state	sec.	▨		20		
B.10	Time for SCT Trunnion 1X resolver error signal to reach steady-state	sec.	▨		20		
B.11	Time for SXT Trunnion MDA Output signal to reach steady-state	sec.	▨		20		
B.18	SHAFT ANGLE CDU	deg	359.997		0.003		

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 10713
REV. A

JOB TIME TO ZERO TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.20	Time for SXT Shaft MDA output signal to reach steady-state	sec.	▨		20		
B.21	Time for SCT Shaft 1X resolver error signal to reach steady-state	sec.	▨		20		
B.22	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		20		

DATE ______

Released with ATP 1009502

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INITIAL TDRR 19950 D.S. PGS 2

JOB TIME TO ZERO TEST

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION The ability of the Optical Subsystem to zero within a specified period of time is checked. The ZERO OPTICS readout requirements of the CDU's are also checked.

M

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22225	1	1,2	WK	TM
B	12-22-65	24849	2,3	1,2	WK	-

REFERENCES ATP 1009502, Paragraphs 3-3.13.1, 3-3.13.2, 3-3.3.1, 3-3.3.2

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted.
    - OIA ON
    - OPTICS POWER ON
    - BLOCK I SERIES 100.
        - NOTE: Assure that the Oscillograph Console has been energized a minimum of 15 minutes immediately prior to use in this test.

3. Assure that the following pushbuttons and indicators on the Remote Optics Controller are lighted:
    - SXT DRIVE NORMAL
    - ZERO OPTICS
    - SCT DRIVE NORMAL
    - CONTROLLER DIRECT.

4. Assure that the following pushbuttons are not lighted:
    - TRACKER
    - TRACKER POWER.

5. Set switches and controls as follows:
    - SHAFT SLEW CONTROL to OFF
    - SLAVE TELESCOPE to STAR LOS
    - TRUNNION SLEW CONTROL to OFF
    - COARSE GAIN CONTROL to HI
    - FINE GAIN CONTROL fully clockwise.

6. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 11 JUN 65

JOB TIME TO ZERO TEST

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SUBSYSTEM OPTICAL

ASSY

B. PROCEDURE

1. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU in the direction of increasing angles to 180.000 (±5)°.

2. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

3. Set switches on Oscillograph Signal Selector panel as follows:
    - a. CHANNEL 1 to 11 (2X TRUNNION CDU 16X resolver error)
    - b. CHANNEL 2 to 12 (SXT TRUNNION Tachometer)
    - c. CHANNEL 3 to 11 (2X TRUNNION CDU Tachometer)
    - d. CHANNEL 4 to 12 (SCT TRUNNION 1X resolver error)
    - e. CHANNEL 5 to 8 (SXT TRUNNION MDA output)
    - f. CHANNEL 6 to 5 (SCT TRUNNION MDA output).

4. Assure that the following indicators are lighted:
    - 800~ 0 PH REFERENCE
    - CH 3 AC
    - CH 4 AC
    - CH 5 AC
    - CH 6 AC.

5. Set following sensitivities on Oscillograph Amplifier panels:
    - CHANNEL 1 - 50 MV/MM
    - CHANNEL 2 - 500 MV/MM
    - CHANNEL 3 - 500 MV/MM
    - CHANNEL 4 - 50 MV/MM
    - CHANNEL 5 - 500 MV/MM
    - CHANNEL 6 - 1000 MV/MM.
        - NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

6. Set CHART DRIVE switch to MM/SEC.

7. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

8. After the 2X TRUNNION CDU has stopped, monitor and record the dial indication.

9. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

10. Monitor oscillograph chart CHANNEL 1 to determine and record the time for the 2X TRUNNION CDU 16X resolver error to reach steady-state.

11. Monitor oscillograph chart CHANNEL 4 to determine and record the time for the SCT Trunnion 1X resolver error to reach steady-state

12. Monitor oscillograph chart CHANNEL 5 to determine and record the time for the SXT Trunnion MDA output to reach steady-state.

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JOB TIME TO ZERO TEST

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SUBSYSTEM OPTICAL

ASSY

13. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

14. Using the SHAFT SLEW CONTROL switch and the COARSE and FINE GAIN CONTROL, drive the SHAFT ANGLE CDU in the direction of increasing angles to 180.000 (±5)° and hold the SHAFT ANGLE CDU at that indication.

15. Set switches on Oscillograph Signal Selector panel as follows:
    - a. CHANNEL 1 to 8 (SXT SHAFT MDA output)
    - b. CHANNEL 2 to 11 (SCT SHAFT Tachometer)
    - c. CHANNEL 3 to 13 (SHAFT ANGLE CDU Tachometer)
    - d. CHANNEL 4 to 13 (SCT SHAFT 1X resolver error)
    - e. CHANNEL 5 to 19 (SHAFT ANGLE CDU 16X resolver error)
    - f. CHANNEL 6 to 10 (SXT SHAFT Tachometer).

16. Assure that the following indicators are lighted:
    - 800 ~ 0 PH REFERENCE
    - CH 3 AC
    - CH 4 AC
    - CH 5 AC
    - CH 6 AC.

17. Set following sensitivities on Oscillograph Amplifier panels:
    - CHANNEL 1 - 1000 MV/MM
    - CHANNEL 2 - 500 MV/MM
    - CHANNEL 3 - 500 MV/MM
    - CHANNEL 4 - 50 MV/MM
    - CHANNEL 5 - 50 MV/MM
    - CHANNEL 6 - 500 MV/MM.

18. Set CHART DRIVE switch to MM/SEC.

19. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

20. After the SHAFT ANGLE CDU has stopped, monitor and record the dial indication.

21. Set CHART DRIVE switch on Oscillograph Control panel to OFF.

22. Monitor oscillograph chart CHANNEL 1 to determine and record the time for the SXT Shaft MDA output to reach steady-state.

23. Monitor oscillograph chart CHANNEL 4 to determine and record the time for the SCT Shaft 1X resolver error to reach steady-state.

24. Monitor oscillograph chart CHANNEL 5 to determine and record the time for the SHAFT ANGLE CDU 16X resolver error to reach steady-state.

DATE 11 JUN 65

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EQUIPMENT TEST
DATA SHEET 1 **OF** 2

JDC NO. 10713
REV. B
INITIAL TDRR 19950

JOB TIME TO ZERO TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION ______

TIME ______ START ______ END ______ TOTAL ELAPSED ______

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______

NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 8	2X TRUNNION CDU	deg	359.994		0.006		
B. 10	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state	sec.	▨		20		
B. 11	Time for SCT Trunnion 1X resolver error signal to reach steady-state	sec.	▨		20		
B. 12	Time for SXT Trunnion MDA Output signal to reach steady-state	sec.	▨		20		
B. 20	SHAFT ANGLE CDU	deg	359.997		0.003		

DATE 11 JUN 65

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EQUIPMENT TEST
DATA SHEET 2 **OF** 2

JDC NO. 10713
REV. B

JOB TIME TO ZERO TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 22	Time for SXT Shaft MDA output signal to reach steady-state	sec.	▨		20		
B. 23	Time for SCT Shaft 1X resolver error signal to reach steady-state	sec.	▨		20		
B. 24	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		20		

DATE 11 JUN 65

Released with ATP 1009502 | JDC 10713 REV. C PAGE 1 OF 3

JOB TIME TO ZERO TEST | INITIAL TDRR 19950 D.S. PGS 2

SUBSYSTEM OPTICAL | ASSY.

DESCRIPTION The ability of the Optical Subsystem to zero within a specified period of time is checked. The ZERO OPTICS readout requirements of the CDU's are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22225	1	1,2	WK	TM
B	12-22-65	24849	2,3	1,2	WK	-
C	9-1-66	30938	3	-	JP	

REFERENCES ATP 1009502, Paragraphs 3-3.13.1, 3-3.13.2, 3-3.3.1, 3-3.3.2

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted.

   OIA ON

   OPTICS POWER ON

   BLOCK I SERIES 100.

   NOTE: Assure that the Oscillograph Console has been energized a minimum of 15 minutes immediately prior to use in this test.

3. Assure that the following pushbuttons and indicators on the Remote Optics Controller are lighted:

   SXT DRIVE NORMAL

   ZERO OPTICS

   SCT DRIVE NORMAL

   CONTROLLER DIRECT.

4. Assure that the following pushbuttons are not lighted:

   TRACKER

   TRACKER POWER.

5. Set switches and controls as follows:

   SHAFT SLEW CONTROL to OFF

   SLAVE TELESCOPE to STAR LOS

   TRUNNION SLEW CONTROL to OFF

   COARSE GAIN CONTROL to HI

   FINE GAIN CONTROL fully clockwise.

6. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE 11 JUN 65

JOB TIME TO ZERO TEST | JDC 10713 REV C PAGE 2 OF 3

SUBSYSTEM OPTICAL | ASSY

B. PROCEDURE

1. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU in the direction of increasing angles to 180.000 (±5)°.

2. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

3. Set switches on Oscillograph Signal Selector panel as follows:
   a. CHANNEL 1 to 11 (2X TRUNNION CDU 16X resolver error)
   b. CHANNEL 2 to 12 (SXT TRUNNION Tachometer)
   c. CHANNEL 3 to 11 (2X TRUNNION CDU Tachometer)
   d. CHANNEL 4 to 12 (SCT TRUNNION 1X resolver error)
   e. CHANNEL 5 to 8 (SXT TRUNNION MDA output)
   f. CHANNEL 6 to 5 (SCT TRUNNION MDA output).

4. Assure that the following indicators are lighted:

   800~ 0 PH REFERENCE

   CH 3 AC

   CH 4 AC

   CH 5 AC

   CH 6 AC.

5. Set following sensitivities on Oscillograph Amplifier panels:

   CHANNEL 1 - 50 MV/MM

   CHANNEL 2 - 500 MV/MM

   CHANNEL 3 - 500 MV/MM

   CHANNEL 4 - 50 MV/MM

   CHANNEL 5 - 500 MV/MM

   CHANNEL 6 - 1000 MV/MM.

   NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

6. Set CHART DRIVE switch to MM/SEC.

7. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

8. After the 2X TRUNNION CDU has stopped, monitor and record the dial indication.

9. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

10. Monitor oscillograph chart CHANNEL 1 to determine and record the time for the 2X TRUNNION CDU 16X resolver error to reach steady-state.

11. Monitor oscillograph chart CHANNEL 4 to determine and record the time for the SCT Trunnion 1X resolver error to reach steady-state

12. Monitor oscillograph chart CHANNEL 5 to determine and record the time for the SXT Trunnion MDA output to reach steady-state.

DATE 11 JUN 65

JOB TIME TO ZERO TEST | JDC 10713 REV C PAGE 3 OF 3

SUBSYSTEM OPTICAL | ASSY

13. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

14. Using the SHAFT SLEW CONTROL switch and the COARSE and FINE GAIN CONTROL, drive the SHAFT ANGLE CDU in the direction of increasing angles to 180.000 (±5)° and hold the SHAFT ANGLE CDU at that indication.

15. Set switches on Oscillograph Signal Selector panel as follows:
   a. CHANNEL 1 to 8 (SXT SHAFT MDA output)
   b. CHANNEL 2 to 11 (SCT SHAFT Tachometer)
   c. CHANNEL 3 to 13 (SHAFT ANGLE CDU Tachometer)
   d. CHANNEL 4 to 13 (SCT SHAFT 1X resolver error)
   e. CHANNEL 5 to 10 (SHAFT ANGLE CDU 16X resolver error)
   f. CHANNEL 6 to 10 (SXT SHAFT Tachometer).

16. Assure that the following indicators are lighted:

   800 ~ 0 PH REFERENCE

   CH 3 AC

   CH 4 AC

   CH 5 AC

   CH 6 AC.

17. Set following sensitivities on Oscillograph Amplifier panels:

   CHANNEL 1 - 1000 MV/MM

   CHANNEL 2 - 500 MV/MM

   CHANNEL 3 - 500 MV/MM

   CHANNEL 4 - 50 MV/MM

   CHANNEL 5 - 50 MV/MM

   CHANNEL 6 - 500 MV/MM.

18. Set CHART DRIVE switch to MM/SEC.

19. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

20. After the SHAFT ANGLE CDU has stopped, monitor and record the dial indication.

21. Set CHART DRIVE switch on Oscillograph Control panel to OFF.

22. Monitor oscillograph chart CHANNEL 1 to determine and record the time for the SXT Shaft MDA output to reach steady-state.

23. Monitor oscillograph chart CHANNEL 4 to determine and record the time for the SCT Shaft 1X resolver error to reach steady-state.

24. Monitor oscillograph chart CHANNEL 5 to determine and record the time for the SHAFT ANGLE CDU 16X resolver error to reach steady-state.

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

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REV. C
INITIAL TDRR 19950

JOB TIME TO ZERO TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.8	2X TRUNNION CDU	deg	359.994		0.006		
B.10	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state	sec.	▨		20		
B.11	Time for SCT Trunnion 1X resolver error signal to reach steady-state	sec.	▨		20		
B.12	Time for SXT Trunnion MDA Output signal to reach steady-state	sec.	▨		20		
B.20	SHAFT ANGLE CDU	deg	359.997		0.003		

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 10713
REV. C

JOB TIME TO ZERO TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 22	Time for SXT Shaft MDA output signal to reach steady-state	sec.	▨		20		
B. 23	Time for SCT Shaft 1X resolver error signal to reach steady-state	sec.	▨		20		
B. 24	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		20		

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JOB TIME TO ZERO TEST

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INITIAL TDRR 19950 D.S. PGS 2

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION The ability of the Optical Subsystem to zero within a specified period of time is checked. The ZERO OPTICS readout requirements of the CDU's are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ATP 1009502, Paragraphs 3-3.13.1, 3-3.13.2, 3-3.3.1, 3-3.3.2

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted.
   OIA ON/ISS POWER DISABLED
   OPTICS POWER ON
   BLOCK I SERIES 100.
   NOTE: Assure that the Oscillograph Console has been energized a minimum of 15 minutes immediately prior to use in this test.
3. Assure that the following pushbuttons and indicators on the Remote Optics Controller are lighted:
   SXT DRIVE NORMAL
   ZERO OPTICS
   SCT DRIVE NORMAL
   CONTROLLER DIRECT.
4. Assure that the following pushbuttons are not lighted:
   TRACKER
   TRACKER POWER.
5. Set switches and controls as follows:
   SHAFT SLEW CONTROL to OFF
   SLAVE TELESCOPE to STAR LOS
   TRUNNION SLEW CONTROL to OFF
   COARSE GAIN CONTROL to HI
   FINE GAIN CONTROL fully clockwise.
6. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton on the

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ______

JOB TIME TO ZERO TEST

JDC 10713 REV PAGE 2 OF 3

SUBSYSTEM OPTICAL

ASSY

Remote Optics Controller to light the MANUAL indicator.

B. PROCEDURE

1. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU in the direction of increasing angles to 180.000 (±5)°.
2. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.
3. Set switches on Oscillograph Signal Selector panel as follows:
   a. CHANNEL 1 to 11 (2X TRUNNION CDU 16X resolver error)
   b. CHANNEL 2 to 12 (SXT TRUNNION Tachometer)
   c. CHANNEL 3 to 11 (2X TRUNNION CDU Tachometer)
   d. CHANNEL 4 to 12 (SCT TRUNNION 1X resolver error)
   e. CHANNEL 5 to 8 (SXT TRUNNION MDA output)
   f. CHANNEL 6 to 5 (SCT TRUNNION MDA output).
4. Assure that the following indicators are lighted:
   800~ 0 PH REFERENCE
   CH 3 AC
   CH 4 AC
   CH 5 AC
   CH 6 AC.
5. Set CHART DRIVE switch to MM/SEC.
6. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.
7. After the 2X TRUNNION CDU has stopped, monitor and record the dial indication.
8. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.
9. Monitor oscillograph chart CHANNEL 1 to determine and record the time for the 2X TRUNNION CDU 16X resolver error to reach steady-state.
10. Monitor oscillograph chart CHANNEL 4 to determine and record the time for the SCT Trunnion 1X resolver error to reach steady-state.
11. Monitor oscillograph chart CHANNEL 5 to determine and record the time for the SXT Trunnion MDA output to reach steady-state.
12. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.
13. Using the SHAFT SLEW CONTROL switch and the FINE GAIN CONTROL, drive the SHAFT ANGLE CDU in the direction of increasing angles to 180.000 (±5)°.
14. Set switches on Oscillograph Signal Selector panel as follows:
   a. CHANNEL 1 to 8 (SXT SHAFT MDA output)

DATE ______

JOB TIME TO ZERO TEST

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SUBSYSTEM OPTICAL

ASSY

   b. CHANNEL 2 to 11 (SCT SHAFT Tachometer)
   c. CHANNEL 3 to 13 (SHAFT ANGLE CDU Tachometer)
   d. CHANNEL 4 to 13 (SCT SHAFT 1X resolver error)
   e. CHANNEL 5 to 10 (SHAFT ANGLE CDU 16X resolver error)
   f. CHANNEL 6 to 10 (SXT SHAFT Tachometer).
15. Assure that the following indicators are lighted:
   800 ~ 0 PH REFERENCE
   CH 3 AC
   CH 4 AC
   CH 5 AC
   CH 6 AC.
16. Set CHART DRIVE switch to MM/SEC.
17. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.
18. After the SHAFT ANGLE CDU has stopped, monitor and record the dial indication.
19. Set CHART DRIVE switch on Oscillograph Control panel to OFF.
20. Monitor oscillograph chart CHANNEL 1 to determine and record the time for the SXT Shaft MDA output to reach steady-state.
21. Monitor oscillograph chart CHANNEL 4 to determine and record the time for the SCT Shaft 1X resolver error to reach steady-state.
22. Monitor oscillograph chart CHANNEL 5 to determine and record the time for the SHAFT ANGLE CDU 16X resolver error to reach steady-state.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

NO. 10713 JDC
REV.
INITIAL TDRR 19950

JOB TIME TO ZERO TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.7	2X TRUNNION CDU	deg	359.994		0.006		
B.9	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state	sec.	▨		15.0		
B.10	Time for SCT Trunnion 1X resolver error signal to reach steady-state	sec.	▨		15.0		
B.11	Time for SXT Trunnion MDA Output signal to reach steady-state	sec.	▨		15.0		
B.18	SHAFT ANGLE CDU	deg	359.997		0.003		

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 10713
REV

JOB TIME TO ZERO TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.20	Time for SXT Shaft MDA output signal to reach steady-state	sec.	▨		15.0		
B.21	Time for SCT Shaft 1X resolver error signal to reach steady-state	sec.	▨		15.0		
B.22	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		15.0		

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Released with ATP 1009502

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INITIAL TDRR 19950 D.S. PGS 5

JOB TRUNNION SERVO LOOP TEST

SUBSYSTEM OPTICAL

ASSY

DESCRIPTION Minimum rate, smoothness, dynamic response and velocity error for trunnion servo loop are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22226	1-6	2, 3	WK	TM

REFERENCES ATP 1009502, Paragraph 3-3.11 and JDC 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

    OIA ON
    OPTICS POWER ON
    BLOCK I SERIES 100.

        NOTE: Assure that the Oscillograph Console and Digital Voltmeter (DVM) have been energized a minimum of 15 minutes prior to use in this test.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

    ZERO OPTICS
    CONTROLLER DIRECT
    SCT DRIVE NORMAL
    SXT DRIVE NORMAL

4. Assure that the following pushbuttons are not lighted:

    TRACKER
    TRACKER POWER.

5. Set switches as follows:

    SHAFT SLEW CONTROL to OFF
    TRUNNION SLEW CONTROL to OFF
    SLAVE TELESCOPE to STAR LOS
    COARSE GAIN CONTROL to HI.

6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

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7. Connect the SXT trunnion MDA input to the DVM by setting the Primary Signal Selector to 106.

8. Set switches on Oscillograph Signal Selector panel as follows:

    a. CHANNEL 1 to 11 (2X TRUNNION CDU 16X resolver error)
    b. CHANNEL 2 to 12 (SXT Trunnion Tachometer)
    c. CHANNEL 3 to 11 (2X TRUNNION CDU Tachometer)
    d. CHANNEL 4 to 12 (SCT Trunnion 1X resolver error)
    e. CHANNEL 5 to 8 (SXT Trunnion MDA output)
    f. CHANNEL 6 to 12 (SXT Trunnion MDA input).

9. Assure that the following indicators are lighted:

    800 ~ 0 PH REFERENCE
    CH 3 AC
    CH 4 AC
    CH 5 AC
    CH 6 AC.

10. Set following sensitivities on Oscillograph Amplifier panels:

    CHANNEL 1 - 1 MV/ MM
    CHANNEL 2 - 50 MV/ MM
    CHANNEL 3 - 50 MV/ MM
    CHANNEL 4 - 1 MV/ MM
    CHANNEL 5 - 100 MV/ MM
    CHANNEL 6 - 50 MV/ MM.

        NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

11. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/ HR.

B. PROCEDURE

1. Press the MANUAL/ ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

2. Press the SXT DRIVE NORMAL/ SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

3. Set the TRUNNION SLEW CONTROL switch to INCR.

4. Adjust the FINE GAIN CONTROL until DVM indicates approximately 0.84 volts. Record DVM voltage indication.

5. Perform following steps in sequence:

    a. Set CHART DRIVE switch on Oscillograph Control panel to MM/ SEC.
    b. Press the SXT DRIVE NORMAL/ SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.
    c. Approximately 10 seconds after performing B.5.b., press the SXT DRIVE NORMAL/ SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

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    d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

        NOTE: The "Steady State" signal is defined as the average value of that signal obtained after the initial transients die out. To find the average value of the signal, it may be necessary to take the average of approximately twenty equally spaced (in time) readings over approximately two seconds of the steady state signal.

6. Record 2X TRUNNION CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 1).

7. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to OFF.

8. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

9. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 175 (±5) degrees.

10. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

11. Set the TRUNNION SLEW CONTROL switch to DECR.

12. Adjust FINE GAIN CONTROL until DVM indicates approximately 0.84 volts. Record DVM voltage indication.

13. Repeat step B.5.

14. Record 2X TRUNNION CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 1).

15. Press the MANUAL/ZERO OPTICS and SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbuttons on Remote Optics Controller to light the ZERO OPTICS and SXT DRIVE NORMAL indicators.

16. After the CDU's have zeroed, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED and MANUAL/ZERO OPTICS pushbuttons to light the SXT DRIVE DISABLED and MANUAL indicators.

17. Set the TRUNNION SLEW CONTROL switch to INCR.

18. Adjust the FINE GAIN CONTROL until DVM indicates approximately 3.58 volts. Record DVM voltage indication.

19. Set following sensitivities on Oscillograph Amplifier panels:

    CHANNEL 1 - 5 MV/MM
    CHANNEL 2 - 200 MV/MM
    CHANNEL 3 - 200 MV/MM
    CHANNEL 4 - 1 MV/MM
    CHANNEL 5 - 200 MV/MM
    CHANNEL 6 - 200 MV/MM.

20. Repeat step B.5.

21. Record SCT TRUNNION 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

22. Repeat steps B.7 through B.11.

23. Adjust the FINE GAIN CONTROL until DVM indicates approximately 3.58 volts. Record DVM voltage indication.

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24. Repeat step B.5.

25. Record SCT TRUNNION 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

26. Press the MANUAL/ZERO OPTICS and SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbuttons on Remote Optics Controller to light the ZERO OPTICS and SXT DRIVE NORMAL indicators.

27. After the CDU's have zeroed, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED and MANUAL/ZERO OPTICS pushbuttons to light the SXT DRIVE DISABLED and MANUAL indicators.

28. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

29. Set following sensitivities on Oscillograph Amplifier panels:

    CHANNEL 1 - 50 MV/MM
    CHANNEL 2 - 1000 MV/MM
    CHANNEL 3 - 1000 MV/MM
    CHANNEL 4 - 50 MV/MM
    CHANNEL 5 - 1000 MV/MM
    CHANNEL 6 - 500 MV/MM.

30. Repeat Step B.5.

31. Record time for the 2X TRUNNION CDU 16X resolver error signal to reach:

    a. The first zero crossover
    b. Steady state, from Oscillograph Chart (CHANNEL 1).

32. Record time for the SXT trunnion tachometer signal to reach steady state, from Oscillograph Chart (CHANNEL 2).

33. Record time for SCT trunnion 1X resolver error signal to reach:

    a. The first zero crossover
    b. Steady state, from Oscillograph Chart (CHANNEL 4).

34. Repeat steps B.7 through B.11.

35. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

36. Repeat steps B.5, B.31 through B.33.

37. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to OFF.

38. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

39. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 90 (±5) degrees.

40. Set the COARSE GAIN CONTROL switch to LO and the FINE GAIN CONTROL fully counterclockwise.

41. Set CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 (SCT Trunnion Tachometer).

42. Set following sensitivities on Oscillograph Amplifier panels:

    CHANNEL 1 - 1 MV/MM
    CHANNEL 2 - 2 MV/MM
    CHANNEL 3 - 1 MV/MM
    CHANNEL 4 - 1 MV/MM
    CHANNEL 5 - 1 MV/MM
    CHANNEL 6 - 1 MV/MM.

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43. Set the FILTER switches on CHANNEL 2, CHANNEL 3, and CHANNEL 5 DEMOD's to LO.

44. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

45. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to either INCR or DECR as necessary, and adjust FINE GAIN CONTROL until the 2X TRUNNION CDU stops moving. Determine value of SXT trunnion tachometer signal from CHANNEL 2 of Oscillograph Chart.

NOTE: Deflection of the Oscillograph pen to the right indicates an increasing signal.

46. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 2 until its nominal value is 7 millivolts above the value determined in step B.45.

47. Press CHART SPEEDS 20 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

48. Set the TRUNNION SLEW CONTROL switch to OFF.

49. Record the maximum peak-to-peak variation in the Servo Velocity Signal (see Figure 1) of the following:
- a. SXT trunnion tachometer (CHANNEL 2)
- b. 2X TRUNNION CDU tachometer (CHANNEL 3).

50. Record the signal width of the Load Disturbance Signal (see Figure 1) at approximately 1/2 positive peak and 1/2 negative peak of the following:
- a. SXT trunnion tachometer (CHANNEL 2)
- b. 2X TRUNNION CDU tachometer (CHANNEL 3).

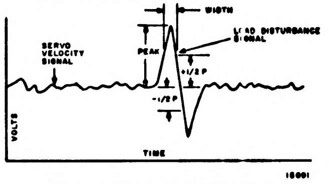

Figure 1. Tachometer Signals During Smoothness Test

51. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

52. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 2 until its nominal value is 7 millivolts below the value determined in step B.45.

53. Press CHART SPEEDS 20 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

54. Set TRUNNION SLEW CONTROL switch to OFF.

55. Repeat step B.49 and B.50.

56. Set switch on Oscillograph Signal Selector as follows:
- a. CHANNEL 1 to OFF

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- b. CHANNEL 2 to OFF
- c. CHANNEL 3 to OFF
- d. CHANNEL 4 to 12 (SCT Trunnion MDA Input)
- e. CHANNEL 5 to 11 (SCT Trunnion Tachometer)
- f. CHANNEL 6 to 5 (SCT Trunnion MDA Output).

57. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - OFF
CHANNEL 2 - OFF
CHANNEL 3 - OFF
CHANNEL 4 - 1000 MV/MM
CHANNEL 5 - 1000 MV/MM
CHANNEL 6 - 1000 MV/MM.

58. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE DISABLED indicator.

59. Set switches as follows:

COARSE GAIN CONTROL to HI
TRUNNION SLEW CONTROL to INCR.

60. Adjust FINE GAIN CONTROL until DVM indicates 10.0 (±0.2) volts.

61. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE to CM/HR.

62. Perform following steps in sequence:
- a. Set CHART DRIVE switch on Oscillograph Control Panel to MM/SEC.
- b. Press the TRACKER pushbutton on the Remote Optics Controller. The pushbutton shall light.
- c. Approximately 10 seconds after performing B.62.b press the TRACKER pushbutton. The pushbutton shall go out.
- d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

63. Record time for SCT Trunnion Tachometer output to reach steady state from Oscillograph Chart (CHANNEL 5).

64. Set the FILTER switch on CHANNEL 5 DEMOD to LO.

65. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 1 MV/MM.

66. Set the COARSE GAIN CONTROL switch on the Remote Optics Controller to LO and the FINE GAIN CONTROL fully counterclockwise.

67. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

68. Press the TRACKER pushbutton on the Remote Optics Controller. The pushbutton shall light.

69. Set the TRUNNION SLEW CONTROL switch to either INCR or DECR, as necessary, and adjust FINE GAIN CONTROL until the SCT trunnion panel angle counter stops moving. Determine value of SCT Trunnion Tachometer signal from CHANNEL 5 of the Oscillograph Chart.

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SUBSYSTEM OPTICAL | ASSY

70. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 5 until its nominal value is 8 millivolts above the value determined in step B.69.

71. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

72. Set the TRUNNION SLEW CONTROL switch to OFF.

73. Record:
- a. The maximum peak-to-peak variation in the Servo Velocity Signal (see figure 1).
- b. The signal width of the Load Disturbance Signal at approximately 1/2 positive peak and 1/2 negative peak (see figure 1) of the SCT trunnion tachometer signal from Oscillograph Chart CHANNEL 5.

74. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

75. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 5 until its nominal value is 8 millivolts below the value determined in step B.69.

76. Repeat steps B.71 through B.73.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

NO. 10714 JDC
REV. A
INITIAL TDRR 19950

JOB TRUNNION SERVO LOOP TEST

ASSEMBLY UNDER TEST

TITLE ________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE ________
NAME ________ SER. NO. ________ CAL DATE ________

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	DVM input voltage indication	volts	▨		▨	▨	▨
B.6	2X TRUNNION CDU 16X resolver error output	mv	▨		4		
B.12	DVM input voltage indication	volts	▨		▨	▨	▨
B.14	2X TRUNNION CDU 16X resolver error output	mv	▨		4		
B.18	DVM input voltage indication	volts	▨		▨	▨	▨
B.21	SCT TRUNNION 1X resolver error output	mv	▨		15		
B.23	DVM input voltage indication	volts	▨		▨	▨	▨
B.25	SCT TRUNNION 1X resolver error output	mv	▨		15		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 10714
REV. A

JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.28	DVM input voltage indication	volts	▨		▨	▨	▨
B.31.a	Time for 2X TRUNNION CDU 16X resolver error signal to reach first zero cross-over	sec.	▨		2.5		
B.31.b	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state	sec.	▨		6		
B.32	Time for SXT trunnion tachometer signal to reach steady-state	sec.	▨		0.5		
B.33.a	Time for SCT trunnion 1X resolver error signal to reach first zero cross-over	sec.	▨		2.5		
B.33.b	Time for SCT trunnion 1X resolver error signal to reach steady-state	sec.	▨		6		
B.35	DVM input voltage indication	volts	▨		▨	▨	▨
B.36 (B. 31.a)	Time for 2X TRUNNION CDU 16X resolver error signal to reach first zero crossover	sec.	▨		2.5		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 10714
REV. A

JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.36 (B. 31.b)	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state		sec.	▨		6		
B.36 (B.32)	Time for SXT trunnion tachometer signal to ready steady-state		sec.	▨		0.5		
B.36 (B. 33.a)	Time for SCT trunnion 1X resolver error signal to reach first zero cross-over		sec.	▨		2.5		
B.36 (B. 33.b)	Time for SCT trunnion 1X resolver error to reach steady-state		sec.	▨		6		
B.49.a	SXT trunnion tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.49.b	2X TRUNNION CDU tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.50.a	SCT trunnion tachometer Load Distribution	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 10714
REV. A

JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.50.b	2X TRUNNION CDU tachometer Load Disturbance	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		
B.55 (B. 49.a)	SXT trunnion tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.55 (B. 49.b)	2X TRUNNION CDU tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.55 (B. 50.a)	SXT trunnion tachometer Load Distribution	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		
B.55 (B. 50.b)	2X TRUNNION CDU tachometer Load Disturbance	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		
B.63	Time for SCT trunnion tachometer signal to reach steady-state		sec.	▨		0.5		
B.73.a	SCT trunnion tachometer maximum variation		mv (peak-to-peak)	▨		8		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 10714
REV. A

JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.73.b	SCT trunnion tachometer Load Disturbance	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		
B.76 (B. 73.a)	SCT trunnion tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.76 (B. 73.b)	SCT trunnion tachometer Load Disturbance	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		

DATE ______

Released with ATP 1009502

JOB TRUNNION SERVO LOOP TEST

JDC 10714 **REV.** B **PAGE** 1 **OF** 7

INITIAL TDRR 19950 **D.S. PGS** 5

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Minimum rate, smoothness, dynamic response and velocity error for trunnion servo loop are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22226	1-6	2, 3	WK	TM
B	10-26-65	23507	All	All	WK	ACM

REFERENCES ATP 1009502, Paragraph 3-3.11 and JDC 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

   OIA ON

   OPTICS POWER ON

   BLOCK I SERIES 100.

   NOTE: Assure that the Oscillograph Console and Digital Voltmeter (DVM) have been energized a minimum of 15 minutes prior to use in this test.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

   ZERO OPTICS

   CONTROLLER DIRECT

   SCT DRIVE NORMAL

   SXT DRIVE NORMAL

4. Assure that the following pushbuttons are not lighted:

   TRACKER

   TRACKER POWER.

5. Set switches as follows:

   SHAFT SLEW CONTROL to OFF

   TRUNNION SLEW CONTROL to OFF

   SLAVE TELESCOPE to STAR LOS

   COARSE GAIN CONTROL to HI.

6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

7. Connect the SXT trunnion MDA input to the DVM by setting the Primary Signal Selector to 106.

8. Set switches on Oscillograph Signal Selector panel as follows:

   a. CHANNEL 1 to 11 (2X TRUNNION CDU 16X resolver error)

   b. CHANNEL 2 to 12 (SXT Trunnion Tachometer)

   c. CHANNEL 3 to 11 (2X TRUNNION CDU Tachometer)

   d. CHANNEL 4 to 12 (SCT Trunnion 1X resolver error)

   e. CHANNEL 5 to 8 (SXT Trunnion MDA output)

   f. CHANNEL 6 to 12 (SXT Trunnion MDA input).

9. Assure that the following indicators are lighted:

   800 ~ 0 PH REFERENCE

   CH 3 AC

   CH 4 AC

   CH 5 AC

   CH 6 AC.

10. Set following sensitivities on Oscillograph Amplifier panels:

   CHANNEL 1 - 1 MV/MM

   CHANNEL 2 - 50 MV/MM

   CHANNEL 3 - 50 MV/MM

   CHANNEL 4 - 1 MV/MM

   CHANNEL 5 - 100 MV/MM

   CHANNEL 6 - 50 MV/MM.

   NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

11. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

B. PROCEDURE

1. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

2. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

3. Set the TRUNNION SLEW CONTROL switch to INCR.

4. Adjust the FINE GAIN CONTROL until DVM indicates approximately 0.84 volts. Record DVM voltage indication.

5. Perform following steps in sequence:

   a. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

   b. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.

   c. Approximately 10 seconds after performing B.5.b., press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

   d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

   NOTE: The "Steady State" signal is defined as the average value of that signal obtained after the initial transients die out. To find the average value of the signal, it may be necessary to take the average of approximately twenty equally spaced (in time) readings over approximately two seconds of the steady state signal.

6. Record 2X TRUNNION CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 1).

7. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to OFF.

8. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

9. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 175 (±5) degrees.

10. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

11. Set the TRUNNION SLEW CONTROL switch to DECR.

12. Adjust FINE GAIN CONTROL until DVM indicates approximately 0.84 volts. Record DVM voltage indication.

13. Repeat step B.5.

14. Record 2X TRUNNION CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 1).

15. Press the MANUAL/ZERO OPTICS and SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbuttons on Remote Optics Controller to light the ZERO OPTICS and SXT DRIVE NORMAL indicators.

16. After the CDU's have zeroed, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED and MANUAL/ZERO OPTICS pushbuttons to light the SXT DRIVE DISABLED and MANUAL indicators.

17. Set the TRUNNION SLEW CONTROL switch to INCR.

18. Adjust the FINE GAIN CONTROL until DVM indicates approximately 3.58 volts. Record DVM voltage indication.

19. Set following sensitivities on Oscillograph Amplifier panels:

   CHANNEL 1 - 5 MV/MM

   CHANNEL 2 - 200 MV/MM

   CHANNEL 3 - 200 MV/MM

   CHANNEL 4 - 1 MV/MM

   CHANNEL 5 - 200 MV/MM

   CHANNEL 6 - 200 MV/MM.

20. Repeat step B.5.

21. Record SCT TRUNNION 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

22. Repeat steps B.7 through B.11.

23. Adjust the FINE GAIN CONTROL until DVM indicates approximately 3.58 volts. Record DVM voltage indication.

24. Repeat step B.5.

25. Record SCT TRUNNION 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

26. Press the MANUAL/ZERO OPTICS and SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbuttons on Remote Optics Controller to light the ZERO OPTICS and SXT DRIVE NORMAL indicators.

27. After the CDU's have zeroed, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED and MANUAL/ZERO OPTICS pushbuttons to light the SXT DRIVE DISABLED and MANUAL indicators.

28. Set the TRUNNION SLEW CONTROL switch to INCR and adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

29. Set following sensitivities on Oscillograph Amplifier panels:

   CHANNEL 1 - 50 MV/MM

   CHANNEL 2 - 1000 MV/MM

   CHANNEL 3 - 1000 MV/MM

   CHANNEL 4 - 50 MV/MM

   CHANNEL 5 - 1000 MV/MM

   CHANNEL 6 - 500 MV/MM.

30. Repeat Step B.5.

31. Record time for the 2X TRUNNION CDU 16X resolver error signal to reach:

   a. The first zero crossover

   b. Steady state, from Oscillograph Chart (CHANNEL 1).

32. Record time for the SXT trunnion tachometer signal to reach steady state, from Oscillograph Chart (CHANNEL 2).

33. Record time for SCT trunnion 1X resolver error signal to reach:

   a. The first zero crossover

   b. Steady state, from Oscillograph Chart (CHANNEL 4).

34. Repeat steps B.7 through B.11.

35. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

36. Repeat steps B.5, B.31 through B.33.

37. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to OFF.

38. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

39. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 90 (±5) degrees.

40. Set the COARSE GAIN CONTROL switch to LO and the FINE GAIN CONTROL fully counterclockwise.

41. Set CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 (SCT Trunnion Tachometer).

42. Set following sensitivities on Oscillograph Amplifier panels:

   CHANNEL 1 - 1 MV/MM

   CHANNEL 2 - 2 MV/MM

   CHANNEL 3 - 1 MV/MM

   CHANNEL 4 - 1 MV/MM

   CHANNEL 5 - 1 MV/MM

   CHANNEL 6 - 1 MV/MM.

43. Set the FILTER switches on CHANNEL 2, CHANNEL 3, and CHANNEL 5 DEMOD's to LO.

44. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

45. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to either INCR or DECR as necessary, and adjust FINE GAIN CONTROL until the 2X TRUNNION CDU stops moving. Determine value of SXT trunnion tachometer signal from CHANNEL 2 of Oscillograph Chart.

NOTE: Deflection of the Oscillograph pen to the right indicates an increasing signal.

46. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 2 until its nominal value is 7 millivolts above the value determined in step B.45.

47. Press CHART SPEEDS 20 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

48. Set the TRUNNION SLEW CONTROL switch to OFF.

49. Record the maximum peak-to-peak variation in the Servo Velocity Signal (see Figure 1) of the following:
- a. SXT trunnion tachometer (CHANNEL 2)
- b. 2X TRUNNION CDU tachometer (CHANNEL 3).

50. Record the signal width of the Load Disturbance Signal (see Figure 1) at approximately 1/2 positive peak and 1/2 negative peak of the following:
- a. SXT trunnion tachometer (CHANNEL 2)
- b. 2X TRUNNION CDU tachometer (CHANNEL 3).

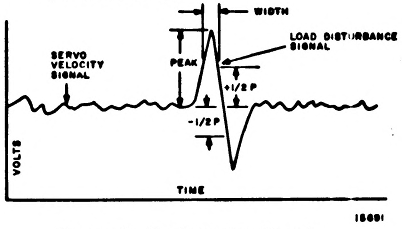

Figure 1. Tachometer Signals During Smoothness Test

51. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

52. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 2 until its nominal value is 7 millivolts below the value determined in step B.45.

53. Press CHART SPEEDS 20 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

54. Set TRUNNION SLEW CONTROL switch to OFF.

55. Repeat step B.49 and B.50.

56. Set switch on Oscillograph Signal Selector as follows:
- a. CHANNEL 1 to OFF

- b. CHANNEL 2 to OFF
- c. CHANNEL 3 to OFF
- d. CHANNEL 4 to 12 (SCT Trunnion MDA Input)
- e. CHANNEL 5 to 11 (SCT Trunnion Tachometer)
- f. CHANNEL 6 to 5 (SCT Trunnion MDA Output).

57. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - OFF
CHANNEL 2 - OFF
CHANNEL 3 - OFF
CHANNEL 4 - 1000 MV/MM
CHANNEL 5 - 1000 MV/MM
CHANNEL 6 - 1000 MV/MM.

58. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE DISABLED indicator.

59. Set switches as follows:

COARSE GAIN CONTROL to HI
TRUNNION SLEW CONTROL to INCR.

60. Adjust FINE GAIN CONTROL until DVM indicates 10.0 (±0.2) volts.

61. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE to CM/HR.

62. Perform following steps in sequence:
- a. Set CHART DRIVE switch on Oscillograph Control Panel to MM/SEC.
- b. Press the TRACKER pushbutton on the Remote Optics Controller. The pushbutton shall light.
- c. Approximately 10 seconds after performing B.62.b press the TRACKER pushbutton. The pushbutton shall go out.
- d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

63. Record time for SCT Trunnion Tachometer output to reach steady state from Oscillograph Chart (CHANNEL 5).

64. Set the FILTER switch on CHANNEL 5 DEMOD to LO.

65. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 1 MV/MM.

66. Set the COARSE GAIN CONTROL switch on the Remote Optics Controller to LO and the FINE GAIN CONTROL fully counterclockwise.

67. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

68. Press the TRACKER pushbutton on the Remote Optics Controller. The pushbutton shall light.

69. Set the TRUNNION SLEW CONTROL switch to either INCR or DECR, as necessary, and adjust FINE GAIN CONTROL until the SCT trunnion panel angle counter stops moving. Determine value of SCT Trunnion Tachometer signal from CHANNEL 5 of the Oscillograph Chart.

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70. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 5 until its nominal value is 8 millivolts above the value determined in step B.69.

71. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

72. Set the TRUNNION SLEW CONTROL switch to OFF.

73. Record:
- a. The maximum peak-to-peak variation in the Servo Velocity Signal (see figure 1).
- b. The signal width of the Load Disturbance Signal at approximately 1/2 positive peak and 1/2 negative peak (see figure 1) of the SCT trunnion tachometer signal from Oscillograph Chart CHANNEL 5.

74. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

75. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 5 until its nominal value is 8 millivolts below the value determined in step B.69.

76. Repeat steps B.71 through B.73.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

NO. 10714 JDC
REV. B
INITIAL TDRR 19950

JOB TRUNNION SERVO LOOP TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	DVM input voltage indication	volts	▨		▨	▨	▨
B.6	2X TRUNNION CDU 16X resolver error output	mv	▨		4		
B.12	DVM input voltage indication	volts	▨		▨	▨	▨
B.14	2X TRUNNION CDU 16X resolver error output	mv	▨		4		
B.18	DVM input voltage indication	volts	▨		▨	▨	▨
B.21	SCT TRUNNION 1X resolver error output	mv	▨		15		
B.23	DVM input voltage indication	volts	▨		▨	▨	▨
B.25	SCT TRUNNION 1X resolver error output	mv	▨		15		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 5

JDC
NO. 10714
REV. B

JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.28	DVM input voltage indication		volts	▨		▨	▨	▨
B.31.a	Time for 2X TRUNNION CDU 16X resolver error signal to reach first zero crossover		sec.	▨		2.5		
B.31.b	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state		sec.	▨		6		
B.32	Time for SXT trunnion tachometer signal to reach steady-state		sec.	▨		0.5		
B.33.a	Time for SCT trunnion 1X resolver error signal to reach first zero crossover		sec.	▨		2.5		
B.33.b	Time for SCT trunnion 1X resolver error signal to reach steady-state		sec.	▨		6		
B.35	DVM input voltage indication		volts	▨		▨	▨	▨
B.36 (B.31.a)	Time for 2X TRUNNION CDU 16X resolver error signal to reach first zero crossover		sec.	▨		2.5		

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EQUIPMENT TEST
DATA SHEET 3 **OF** 5

JDC
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JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.36 (B.31.b)	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state		sec.	▨		6		
B.36 (B.32)	Time for SXT trunnion tachometer signal to ready steady-state		sec.	▨		0.5		
B.36 (B.33.a)	Time for SCT trunnion 1X resolver error signal to reach first zero crossover		sec.	▨		2.5		
B.36 (B.33.b)	Time for SCT trunnion 1X resolver error to reach steady-state		sec.	▨		6		
B.49.a	SXT trunnion tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.49.b	2X TRUNNION CDU tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.50.a	SXT trunnion tachometer Load Distribution	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		

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EQUIPMENT TEST
DATA SHEET 4 **OF** 5

JDC
NO. 10714
REV. B

JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.50.b	2X TRUNNION CDU tachometer Load Disturbance	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		
B.55 (B.49.a)	SXT trunnion tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.55 (B.49.b)	2X TRUNNION CDU tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.55 (B.50.a)	SXT trunnion tachometer Load Distribution	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		
B.55 (B.50.b)	2X TRUNNION CDU tachometer Load Disturbance	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		
B.63	Time for SCT trunnion tachometer signal to reach steady-state		sec.	▨		0.5		
B.73.a	SCT trunnion tachometer maximum variation		mv (peak-to-peak)	▨		8		

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EQUIPMENT TEST
DATA SHEET 5 **OF** 5

JDC
NO. 10714
REV. B

JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.73.b	SCT trunnion tachometer Load Disturbance	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		
B.76 (B.73.a)	SCT trunnion tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.76 (B.73.b)	SCT trunnion tachometer Load Disturbance	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		

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Released with ATP 1009502

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JOB TRUNNION SERVO LOOP TEST

INITIAL TDRR 19950 D.S. PGS 4

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Minimum rate, smoothness, dynamic response and velocity error for trunnion servo loop are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22226	1-6	2, 3	WK	TM
B	10-26-65	23507	All	All	WK	ACM
C	3-10-66	27034	5	4	WK	WM

REFERENCES ATP 1009502, Paragraph 3-3.11 and JDC 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON

OPTICS POWER ON

BLOCK I SERIES 100.

NOTE: Assure that the Oscillograph Console and Digital Voltmeter (DVM) have been energized a minimum of 15 minutes prior to use in this test.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

ZERO OPTICS

CONTROLLER DIRECT

SCT DRIVE NORMAL

SXT DRIVE NORMAL

4. Assure that the following pushbuttons are not lighted:

TRACKER

TRACKER POWER.

5. Set switches as follows:

SHAFT SLEW CONTROL to OFF

TRUNNION SLEW CONTROL to OFF

SLAVE TELESCOPE to STAR LOS

COARSE GAIN CONTROL to HI.

6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 11 JUN 65

JOB TRUNNION SERVO LOOP TEST

JDC 10714 REV C PAGE 2 OF 5

SUBSYSTEM OPTICAL

ASSY

7. Connect the SXT trunnion MDA input to the DVM by setting the Primary Signal Selector to 106.

8. Set switches on Oscillograph Signal Selector panel as follows:

a. CHANNEL 1 to 11 (2X TRUNNION CDU 16X resolver error)

b. CHANNEL 2 to 12 (SXT Trunnion Tachometer)

c. CHANNEL 3 to 11 (2X TRUNNION CDU Tachometer)

d. CHANNEL 4 to 12 (SCT Trunnion 1X resolver error)

e. CHANNEL 5 to 8 (SXT Trunnion MDA output)

f. CHANNEL 6 to 12 (SXT Trunnion MDA input).

9. Assure that the following indicators are lighted:

800 ~ 0 PH REFERENCE

CH 3 AC

CH 4 AC

CH 5 AC

CH 6 AC.

10. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 1 MV/MM

CHANNEL 2 - 50 MV/MM

CHANNEL 3 - 50 MV/MM

CHANNEL 4 - 1 MV/MM

CHANNEL 5 - 100 MV/MM

CHANNEL 6 - 50 MV/MM.

NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

11. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

B. PROCEDURE

1. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

2. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

3. Set the TRUNNION SLEW CONTROL switch to INCR.

4. Adjust the FINE GAIN CONTROL until DVM indicates approximately 0.84 volts. Record DVM voltage indication.

5. Perform following steps in sequence:

a. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

b. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.

c. Approximately 10 seconds after performing B.5.b., press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

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JOB TRUNNION SERVO LOOP TEST

JDC 10714 REV C PAGE 3 OF 5

SUBSYSTEM OPTICAL

ASSY

d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

NOTE: The "Steady State" signal is defined as the average value of that signal obtained after the initial transients die out. To find the average value of the signal, it may be necessary to take the average of approximately twenty equally spaced (in time) readings over approximately two seconds of the steady state signal.

6. Record 2X TRUNNION CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 1).

7. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to OFF.

8. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

9. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 175 (±5) degrees.

10. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

11. Set the TRUNNION SLEW CONTROL switch to DECR.

12. Adjust FINE GAIN CONTROL until DVM indicates approximately 0.84 volts. Record DVM voltage indication.

13. Repeat step B.5.

14. Record 2X TRUNNION CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 1).

15. Press the MANUAL/ZERO OPTICS and SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbuttons on Remote Optics Controller to light the ZERO OPTICS and SXT DRIVE NORMAL indicators.

16. After the CDU's have zeroed, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED and MANUAL/ZERO OPTICS pushbuttons to light the SXT DRIVE DISABLED and MANUAL indicators.

17. Set the TRUNNION SLEW CONTROL switch to INCR.

18. Adjust the FINE GAIN CONTROL until DVM indicates approximately 3.58 volts. Record DVM voltage indication.

19. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 5 MV/MM

CHANNEL 2 - 200 MV/MM

CHANNEL 3 - 200 MV/MM

CHANNEL 4 - 1 MV/MM

CHANNEL 5 - 200 MV/MM

CHANNEL 6 - 200 MV/MM.

20. Repeat step B.5.

21. Record SCT TRUNNION 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

22. Repeat steps B.7 through B.11.

23. Adjust the FINE GAIN CONTROL until DVM indicates approximately 3.58 volts. Record DVM voltage indication.

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JOB TRUNNION SERVO LOOP TEST

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SUBSYSTEM OPTICAL

ASSY

24. Repeat step B.5.

25. Record SCT TRUNNION 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

26. Press the MANUAL/ZERO OPTICS and SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbuttons on Remote Optics Controller to light the ZERO OPTICS and SXT DRIVE NORMAL indicators.

27. After the CDU's have zeroed, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED and MANUAL/ZERO OPTICS pushbuttons to light the SXT DRIVE DISABLED and MANUAL indicators.

28. Set the TRUNNION SLEW CONTROL switch to INCR and adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

29. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 50 MV/MM

CHANNEL 2 - 1000 MV/MM

CHANNEL 3 - 1000 MV/MM

CHANNEL 4 - 50 MV/MM

CHANNEL 5 - 1000 MV/MM

CHANNEL 6 - 500 MV/MM.

30. Repeat Step B.5.

31. Record time for the 2X TRUNNION CDU 16X resolver error signal to reach:

a. The first zero crossover

b. Steady state, from Oscillograph Chart (CHANNEL 1).

32. Record time for the SXT trunnion tachometer signal to reach steady state, from Oscillograph Chart (CHANNEL 2).

33. Record time for SCT trunnion 1X resolver error signal to reach:

a. The first zero crossover

b. Steady state, from Oscillograph Chart (CHANNEL 4).

34. Repeat steps B.7 through B.11.

35. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

36. Repeat steps B.5, B.31 through B.33.

37. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to OFF.

38. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

39. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 90 (±5) degrees.

40. Set the COARSE GAIN CONTROL switch to LO and the FINE GAIN CONTROL fully counterclockwise.

41. Set CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 (SCT Trunnion Tachometer).

42. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 1 MV/MM

CHANNEL 2 - 2 MV/MM

CHANNEL 3 - 1 MV/MM

CHANNEL 4 - 1 MV/MM

CHANNEL 5 - 1 MV/MM

CHANNEL 6 - 1 MV/MM.

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JOB TRUNNION SERVO LOOP TEST | JDC 10714 REV B PAGE 5 OF 5

SUBSYSTEM OPTICAL | ASSY

43. Set the FILTER switches on CHANNEL 2, CHANNEL 3, and CHANNEL 5 DEMOD's to LO.

44. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

45. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to either INCR or DECR as necessary, and adjust FINE GAIN CONTROL until the 2X TRUNNION CDU stops moving. Determine value of SXT trunnion tachometer signal from CHANNEL 2 of Oscillograph Chart.

NOTE: Deflection of the Oscillograph pen to the right indicates an increasing signal.

46. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 2 until its nominal value is 7 millivolts above the value determined in step B.45.

47. Press CHART SPEEDS 20 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

48. Set the TRUNNION SLEW CONTROL switch to OFF.

49. Record the maximum peak-to-peak variation in the Servo Velocity Signal (see Figure 1) of the following:

- a. SXT trunnion tachometer (CHANNEL 2)
- b. 2X TRUNNION CDU tachometer (CHANNEL 3).

50. Record the signal width of the Load Disturbance Signal (see Figure 1) at approximately 1/2 positive peak and 1/2 negative peak of the following:

- a. SXT trunnion tachometer (CHANNEL 2)
- b. 2X TRUNNION CDU tachometer (CHANNEL 3).

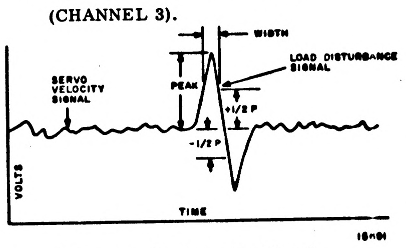

Figure 1. Tachometer Signals During Smoothness Test

51. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

52. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 2 until its nominal value is 7 millivolts below the value determined in step B.45.

53. Press CHART SPEEDS 20 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

54. Set TRUNNION SLEW CONTROL switch to OFF.

55. Repeat step B.49 and B.50.

56. thru B.76. (Deleted)

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 10714
REV. C
INITIAL TDRR 19950

JOB TRUNNION SERVO LOOP TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	DVM input voltage indication	volts	▨		▨	▨	▨
B.6	2X TRUNNION CDU 16X resolver error output	mv	▨		4		
B.12	DVM input voltage indication	volts	▨		▨	▨	▨
B.14	2X TRUNNION CDU 16X resolver error output	mv	▨		4		
B.18	DVM input voltage indication	volts	▨		▨	▨	▨
B.21	SCT TRUNNION 1X resolver error output	mv	▨		15		
B.23	DVM input voltage indication	volts	▨		▨	▨	▨
B.25	SCT TRUNNION 1X resolver error output	mv	▨		15		

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 10714
REV. C

JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.28	DVM input voltage indication	volts	▨		▨	▨	▨
B.31.a	Time for 2X TRUNNION CDU 16X resolver error signal to reach first zero crossover	sec.	▨		2.5		
B.31.b	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state	sec.	▨		6		
B.32	Time for SXT trunnion tachometer signal to reach steady-state	sec.	▨		0.5		
B.33.a	Time for SCT trunnion 1X resolver error signal to reach first zero crossover	sec.	▨		2.5		
B.33.b	Time for SCT trunnion 1X resolver error signal to reach steady-state	sec.	▨		6		
B.35	DVM input voltage indication	volts	▨		▨	▨	▨
B.36 (B.31.a)	Time for 2X TRUNNION CDU 16X resolver error signal to reach first zero crossover	sec.	▨		2.5		

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JDC
NO. 10714
REV. C

JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.36 (B.31.b)	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state		sec.	▨		6		
B.36 (B.32)	Time for SXT trunnion tachometer signal to ready steady-state		sec.	▨		0.5		
B.36 (B.33.a)	Time for SCT trunnion 1X resolver error signal to reach first zero crossover		sec.	▨		2.5		
B.36 (B.33.b)	Time for SCT trunnion 1X resolver error to reach steady-state		sec.	▨		6		
B.49.a	SXT trunnion tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.49.b	2X TRUNNION CDU tachometer maximum variation		mv (peak-to-peak)	▨		8		
B.50.a	SXT trunnion tachometer Load Distribution	+1/2 P	milli-sec	▨		250		
		-1/2 P	milli-sec	▨		250		

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Released with ATP 1009502

JOB TRUNNION SERVO LOOP TEST

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INITIAL TDRR 19950 D.S. PGS 3

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Minimum rate, smoothness, dynamic response and velocity error for trunnion servo loop are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ATP 1009502, Paragraph 3-3.11 and JDC 10734.

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON/ ISS POWER DISABLED
OPTICS POWER ON
BLOCK I SERIES 100.

NOTE: Assure that the Oscillograph Console and Digital Voltmeter (DVM) have been energized a minimum of 15 minutes prior to use in this test.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

MANUAL
CONTROLLER DIRECT
SCT DRIVE NORMAL
SXT DRIVE DISABLED.

4. Assure that the following pushbuttons are not lighted:

TRACKER
TRACKER POWER.

5. Set switches as follows:

SHAFT SLEW CONTROL to OFF
TRUNNION SLEW CONTROL to OFF
SLAVE TELESCOPE to STAR LOS
COARSE GAIN CONTROL to HI.

6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ______

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7. Connect the SXT trunnion MDA input to the DVM by setting the Primary Signal Selector to 106.

8. Press the MANUAL/ ZERO OPTICS pushbutton to light the ZERO OPTICS indicator.

9. Set switches on Oscillograph Signal Selector panel as follows:

   a. CHANNEL 1 to 11 (2X TRUNNION CDU 16X resolver error)
   b. CHANNEL 2 to 12 (SXT Trunnion Tachometer)
   c. CHANNEL 3 to 11 (2X TRUNNION CDU Tachometer)
   d. CHANNEL 4 to 12 (SCT Trunnion 1X resolver error)
   e. CHANNEL 5 to 8 (SXT Trunnion MDA output)
   f. CHANNEL 6 to 12 (SXT Trunnion MDA input).

10. Assure that the following indicators are lighted:

800 ~ 0 PH REFERENCE
CH 3 AC
CH 4 AC
CH 5 AC
CH 6 AC.

11. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 1 MV/ MM
CHANNEL 2 - 50 MV/ MM
CHANNEL 3 - 50 MV/ MM
CHANNEL 4 - 1 MV/ MM
CHANNEL 5 - 100 MV/ MM
CHANNEL 6 - 50 MV/ MM.

NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

12. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/ HR.

B. PROCEDURE

1. Press the MANUAL/ ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

2. Press the SXT DRIVE NORMAL/ SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

3. Set the TRUNNION SLEW CONTROL switch to INCR.

4. Adjust the FINE GAIN CONTROL until DVM indicates approximately 0.84 volts. Record DVM voltage indication.

5. Perform following steps in sequence:

   a. Set CHART DRIVE switch on Oscillograph Control panel to MM/ SEC.
   b. Press the SXT DRIVE NORMAL/ SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.
   c. Approximately 10 seconds after performing B.5.b., press the SXT DRIVE NORMAL/ SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

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   d. Set CHART DRIVE switch on Oscillograph Control panel to CM/ HR.

6. Record 2X TRUNNION CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 1).

7. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to OFF.

8. Press the SXT DRIVE NORMAL/ SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

9. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 175 (±5) degrees.

10. Press the SXT DRIVE NORMAL/ SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

11. Set the TRUNNION SLEW CONTROL switch to DECR.

12. Adjust FINE GAIN CONTROL until DVM indicates approximately 0.84 volts. Record DVM voltage indication.

13. Repeat step B.5.

14. Record 2X TRUNNION CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 1).

15. Press the MANUAL/ ZERO OPTICS pushbutton on Remote Optics Controller to light the ZERO OPTICS indicator.

16. After the CDU's have zeroed, press the MANUAL/ ZERO OPTICS pushbutton to light the MANUAL indicator.

17. Set the TRUNNION SLEW CONTROL switch to INCR.

18. Adjust the FINE GAIN CONTROL until DVM indicates approximately 3.58 volts. Record DVM voltage indication.

19. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 5 MV/ MM
CHANNEL 2 - 200 MV/ MM
CHANNEL 3 - 200 MV/ MM
CHANNEL 4 - 1 MV/ MM
CHANNEL 5 - 200 MV/ MM
CHANNEL 6 - 200 MV/ MM.

20. Repeat step B.5.

21. Record SCT TRUNNION 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

22. Repeat steps B.7 through B.11.

23. Adjust the FINE GAIN CONTROL until DVM indicates approximately 3.58 volts. Record DVM voltage indication.

24. Repeat step B.5.

25. Record SCT TRUNNION 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

26. Press the MANUAL/ ZERO OPTICS pushbutton on Remote Optics Controller to light the ZERO OPTICS indicator.

27. After the CDU's have zeroed, press the MANUAL/ ZERO OPTICS pushbutton to light the MANUAL indicator.

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28. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

29. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 10 MV/ MM
CHANNEL 2 - 1000 MV/ MM
CHANNEL 3 - 1000 MV/ MM
CHANNEL 4 - 10 MV/ MM
CHANNEL 5 - 1000 MV/ MM
CHANNEL 6 - 500 MV/ MM.

30. Repeat step B.5.

31. Record time for the 2X TRUNNION CDU 16X resolver error signal to reach steady state, from Oscillograph Chart (CHANNEL 1).

32. Record time for the SXT trunnion tachometer signal to reach steady state, from Oscillograph Chart (CHANNEL 2).

33. Record time for SCT trunnion 1X resolver error signal to reach steady state, from Oscillograph Chart (CHANNEL 4).

34. Repeat steps B.7 through B.11.

35. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

36. Repeat steps B.5, B.31 through B.33.

37. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to OFF.

38. Press the SXT DRIVE NORMAL/ SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

39. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL, drive the 2X TRUNNION CDU to 90 (±5) degrees.

40. Set the COARSE GAIN CONTROL switch to LO and the FINE GAIN CONTROL fully counterclockwise.

41. Set CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 (SCT Trunnion Tachometer).

42. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 1 MV/ MM
CHANNEL 2 - 2 MV/ MM
CHANNEL 3 - 1 MV/ MM
CHANNEL 4 - 1 MV/ MM
CHANNEL 5 - 1 MV/ MM
CHANNEL 6 - 1 MV/ MM.

43. Set the FILTER switches on CHANNEL 2, CHANNEL 3, and CHANNEL 5 DEMOD's to LO.

44. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/ SEC.

45. Set the TRUNNION SLEW CONTROL switch on the Remote Optics Controller to either INCR or DECR as necessary, and adjust FINE GAIN CONTROL until the 2X TRUNNION CDU stops moving. Determine value of SXT trunnion tachometer signal from CHANNEL 2 of Oscillograph Chart.

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NOTE: Deflection of the Oscillograph pen to the right indicates an increasing signal.

46. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 2 until its nominal value is 7 millivolts above the value determined in step B.45.

47. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

48. Set the TRUNNION SLEW CONTROL switch to OFF.

49. Record the maximum peak-to-peak variation of the following signals:
- a. SXT trunnion tachometer (CHANNEL 2)
- b. 2X TRUNNION CDU tachometer (CHANNEL 3)
- c. SCT trunnion tachometer (CHANNEL 5).

50. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

51. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 2 until its nominal value is 7 millivolts below the value determined in step B.45.

52. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

53. Set TRUNNION SLEW CONTROL switch to OFF.

54. Repeat step B.49.

55. Set switches on Oscillograph Signal Selector as follows:
- a. CHANNEL 1 to OFF
- b. CHANNEL 2 to OFF
- c. CHANNEL 3 to OFF
- d. CHANNEL 4 to 12 (SCT Trunnion MDA Input)
- e. CHANNEL 5 to 11 (SCT Trunnion Tachometer)
- f. CHANNEL 6 to 5 (SCT Trunnion MDA Output).

56. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - OFF
CHANNEL 2 - OFF
CHANNEL 3 - OFF
CHANNEL 4 - 1000 MV/MM
CHANNEL 5 - 1000 MV/MM
CHANNEL 6 - 1000 MV/MM.

57. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE DISABLED indicator.

58. Set switches as follows:

COARSE GAIN CONTROL to HI
TRUNNION SLEW CONTROL to INCR.

59. Adjust FINE GAIN CONTROL until DVM indicates 10.0 (±0.2) volts.

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60. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE to CM/HR.

61. Perform following steps in sequence:
- a. Set CHART DRIVE switch on Oscillograph Control Panel to MM/SEC.
- b. Press the TRACKER pushbutton on the Remote Optics Controller. The pushbutton shall light.
- c. Approximately 10 seconds after performing B.61.b., press the TRACKER pushbutton. The pushbutton shall go out.
- d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

62. Record value of SCT Trunnion Tachometer steady state signal from Oscillograph Chart (CHANNEL 5).

63. Record time for SCT Trunnion Tachometer output to reach steady state from Oscillograph Chart (CHANNEL 5).

64. Set the FILTER switch on CHANNEL 5 DEMOD to LO.

65. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 1 MV/MM.

66. Set the COARSE GAIN CONTROL switch on the Remote Optics Controller to LO and the FINE GAIN CONTROL fully counterclockwise.

67. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

68. Press the TRACKER pushbutton on the Remote Optics Controller. The pushbutton shall light.

69. Set the TRUNNION SLEW CONTROL switch to either INCR or DECR, as necessary, and adjust FINE GAIN CONTROL until the SCT trunnion panel angle counter stops moving. Determine value of SCT Trunnion Tachometer signal from CHANNEL 5 of the Oscillograph Chart.

70. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 5 until its nominal value is 8 millivolts above the value determined in step B.69.

71. Press CHART SPEEDS 10 pushbutton on the Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

72. Set the TRUNNION SLEW CONTROL switch to OFF.

73. Record the maximum peak-to-peak variation of the SCT trunnion tachometer signal from Oscillograph Chart CHANNEL 5.

74. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

75. Using the TRUNNION SLEW CONTROL switch and the FINE GAIN CONTROL on the

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Remote Optics Controller, decrease the tachometer signal on CHANNEL 5 until its nominal value is 8 millivolts below the value determined in step B.69.

76. Repeat steps B.71 through B.73.

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JOB TRUNNION SERVO LOOP TEST

ASSEMBLY UNDER TEST

TITLE ________________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________________ SER. NO. ________ CAL DATE
NAME ________________ SER. NO. ________ CAL DATE

CONDUCTED BY ________________ NAME/AFFILIATION APPROVED BY ________________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	DVM input voltage indication	volts	▨		▨	▨	▨
B.6	2X TRUNNION CDU 16X resolver error output	mv	▨		4		
B.12	DVM input voltage indication	volts	▨		▨	▨	▨
B.14	2X TRUNNION CDU 16X resolver error output	mv	▨		4		
B.18	DVM input voltage indication	volts	▨		▨	▨	▨
B.21	SCT TRUNNION 1X resolver error output	mv	▨		15		
B.23	DVM input voltage indication	volts	▨		▨	▨	▨
B.25	SCT TRUNNION 1X resolver error output	mv	▨		15		

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JDC
NO. 10714
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JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.27	DVM input voltage indication	volts	▨		▨	▨	▨
B.31	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state	sec.	▨		2.5		
B.32	Time for SXT trunnion tachometer signal to reach steady-state	sec.	▨		0.5		
B.33	Time for SCT trunnion 1X resolver error signal to reach steady-state	sec.	▨		2.5		
B.35	DVM input voltage indication	volts	▨		▨	▨	▨
B.36 (B.31)	Time for 2X TRUNNION CDU 16X resolver error signal to reach steady-state	sec.	▨		2.5		
B.36 (B.32)	Time for SXT trunnion tachometer signal to ready steady-state	sec.	▨		0.5		
B.36 (B.33)	Time for SCT trunnion 1X resolver error signal to reach steady-state	sec.	▨		2.5		
B.49.a	SXT trunnion tachometer maximum variation	mv (peak-to-peak)	▨		8		

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JOB TRUNNION SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.b	2X TRUNNION CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49.c	SCT trunnion tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.54 (B.49.a)	SXT trunnion tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.54 (B.49.b)	2X TRUNNION CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.54 (B.49.c)	SCT trunnion tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.62	SCT trunnion tachometer output	volts	8		10.5		
B.63	Time for SCT trunnion tachometer signal to reach steady-state	sec.	▨		0.5		
B.73	SCT trunnion tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.76 (B.73)	SCT trunnion tachometer maximum variation	mv (peak-to-peak)	▨		8		

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JOB SHAFT SERVO LOOP TEST

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INITIAL TDRR 19950 **D.S. PGS** 4

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Minimum rate, smoothness, dynamic response and velocity error for shaft servo loop are tested.

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			JDC	D.S.	MIT	NASA
A	9-1-65	22227	All	All	WK [illegible]	TM [illegible]

REFERENCES ATP 1009502, Paragraph 3-3.11, JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON
OPTICS POWER ON
BLOCK 1 SERIES 100.

NOTE: Assure that the Oscillograph Console and Digital Voltmeter (DVM) have been energized a minimum of 15 minutes immediately prior to use in this test.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

ZERO OPTICS
CONTROLLER DIRECT
SCT DRIVE NORMAL
SXT DRIVE NORMAL

4. Assure that the following pushbuttons are not lighted:

TRACKER
TRACKER POWER.

5. Set switches as follows:

SHAFT SLEW CONTROL to OFF
TRUNNION SLEW CONTROL to OFF
SLAVE TELESCOPE to STAR LOS
COARSE GAIN CONTROL to MED.

6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

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7. Connect the SXT Shaft MDA Input to the DVM by setting the Primary Signal Selector to 203.

8. Set switches on Oscillograph Signal Selector panel as follows:

a. CHANNEL 1 to 8 (SXT shaft MDA Output)

b. CHANNEL 2 to 13 (SXT shaft MDA input)

c. CHANNEL 3 to 13 (SHAFT ANGLE CDU tachometer)

d. CHANNEL 4 to 13 (SCT shaft 1X resolver error)

e. CHANNEL 5 to 10 (SHAFT ANGLE CDU 16X resolver error)

f. CHANNEL 6 to 10 (SXT shaft tachometer).

9. Assure that the following indicators are lighted:

800~ 0 PH REFERENCE
CH 3 AC
CH 4 AC
CH 5 AC
CH 6 AC.

10. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 100 MV/MM
CHANNEL 2 - 100 MV/MM
CHANNEL 3 - 100 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 100 MV/MM.

NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

11. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

B. PROCEDURE

1. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

2. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

3. Set SHAFT SLEW CONTROL switch to INCR.

4. Adjust FINE GAIN CONTROL until DVM indicates approximately 0.606 volts. Record DVM voltage indication.

5. Perform following steps in sequence:

a. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

b. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.

c. Approximately 10 seconds after performing step B.5.b, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

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NOTE: The "steady state" signal is defined as the average value of that signal obtained after the initial transients die out. To find the average value of the signal, it may be necessary to take the average of approximately twenty equally spaced (in time) readings over approximately two seconds of the steady state signal.

6. Record SHAFT ANGLE CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 5).

7. Set SHAFT SLEW CONTROL switch on the Remote Optics Controller to DECR.

8. Record DVM voltage indication.

9. Repeat step B.5.

10. Record SHAFT ANGLE CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 5).

11. Press the MANUAL/ZERO OPTICS and SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbuttons on the Remote Optics Controller to light the ZERO OPTICS and SXT DRIVE NORMAL indicators.

12. After the CDU's have zeroed, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED and MANUAL/ZERO OPTICS pushbuttons to light the SXT DRIVE DISABLED and MANUAL indicators.

13. Set switches as follows:

COARSE GAIN CONTROL to HI
SHAFT SLEW CONTROL to INCR.

14. Adjust the FINE GAIN CONTROL until DVM indicates approximately 1.82 volts. Record DVM voltage indication.

15. Set the following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 200 MV/MM
CHANNEL 2 - 200 MV/MM
CHANNEL 3 - 200 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 5 MV/MM
CHANNEL 6 - 200 MV/MM.

16. Repeat step B.5.

17. Record SCT Shaft 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

18. Repeat steps B.7 and B.8.

19. Repeat step B.5.

20. Record SCT Shaft 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

21. Repeat steps B.11 and B.12.

22. Set SHAFT SLEW CONTROL switch to INCR.

23. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

24. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 1000 MV/MM
CHANNEL 2 - 500 MV/MM

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CHANNEL 3 - 1000 MV/MM
CHANNEL 4 - 50 MV/MM
CHANNEL 5 - 50 MV/MM
CHANNEL 6 - 1000 MV/MM.

25. Repeat step B.5.

26. Record time for the SXT shaft tachometer output to reach steady state, from Oscillograph Chart (CHANNEL 6).

27. Record time for the SCT shaft 1X resolver error to reach (a) the first zero crossover, and (b) steady state, from Oscillograph Chart (CHANNEL 4).

28. Record time for the SHAFT ANGLE CDU 16X resolver error to reach (a) the first zero crossover, and (b) steady state, from Oscillograph Chart (CHANNEL 5).

29. Set SHAFT SLEW CONTROL switch on the Remote Optics Controller to DECR.

30. Record DVM voltage indication.

31. Repeat steps B.5, B.26, B.27 and B.28.

32. Set the COARSE GAIN CONTROL switch on the Remote Optics Controller to LO and the FINE GAIN CONTROL fully counterclockwise.

33. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 20 MV/MM
CHANNEL 2 - 1 MV/MM
CHANNEL 3 - 1 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 1 MV/MM.

34. Set the FILTER switches on CHANNEL 4, CHANNEL 5, and CHANNEL 6 DEMOD's to LO.

35. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

36. Set CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 (SCT shaft tachometer).

37. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

38. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

39. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

40. Set the SHAFT SLEW CONTROL switch on either INCR or DECR as necessary, and adjust FINE GAIN CONTROL until the SHAFT ANGLE CDU stops moving. Determine value of SXT shaft tachometer signal from CHANNEL 6 of the Oscillograph Chart.

NOTE: Deflection of the Oscillograph to the right indicates an increasing signal.

41. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 6 until its nominal value is 7 millivolts above the value determined in step B.40.

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42. Press CHART SPEEDS 20 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

43. Set the SHAFT SLEW CONTROL switch to OFF.

44. Record the maximum peak-to-peak variation in the Servo Velocity Signal (see Figure 1) of the following:

- a. SCT shaft tachometer (CHANNEL 1)
- b. SHAFT ANGLE CDU tachometer (CHANNEL 3)
- c. SXT shaft tachometer (CHANNEL 6).

45. Record the signal width of the Load Disturbance Signal (see Figure 1) at approximately 1/2 positive peak and 1/2 negative peak of the following:

- a. SCT shaft tachometer (CHANNEL 1)
- b. SHAFT ANGLE CDU tachometer (CHANNEL 3)
- c. SXT shaft tachometer (CHANNEL 6)

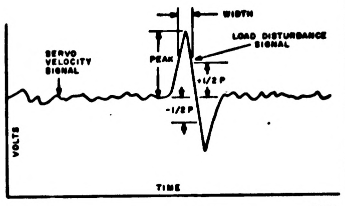

Figure 1

Tachometer Signals During Smoothness Test

46. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

47. Using the SHAFT SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 6 until its nominal value is 7 millivolts below the value determined in step B.40.

48. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

49. Set the SHAFT SLEW CONTROL switch to OFF.

50. Repeat step B.44.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 10715
REV. A
INITIAL TDRR 19950

JOB SHAFT SERVO LOOP TEST

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE

NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	DVM input voltage indication	volts	▨		▨	▨	▨
B.6	SHAFT ANGLE CDU 16X resolver error output	mv	▨		4		
B.8	DVM input voltage indication	volts	▨		▨	▨	▨
B.10	SHAFT ANGLE CDU 16X resolver error output	mv	▨		4		
B.14	DVM input voltage indication	volts	▨		▨	▨	▨
B.18	SCT Shaft 1X resolver error output	mv	▨		40		
B.19 (B.8)	DVM input voltage indication	volts	▨		▨	▨	▨
B.20	SCT Shaft 1X resolver error output	mv	▨		40		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 10715
REV. A

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.23	DVM input voltage indication	volts	▨		▨	▨	▨
B.26	Time for SXT shaft tachometer signal to reach steady-state	sec.	▨		0.5		
B.27.a	Time for SCT 1X resolver error signal to reach first zero cross-over	sec.	▨		2.5		
B.27.b	Time for SCT 1X resolver error signal to reach steady-state	sec.	▨		6		
B.28.a	Time for SHAFT ANGLE CDU 16X resolver error signal to reach first zero cross-over	sec.	▨		2.5		
B.28.b	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		6		
B.30	DVM input voltage indication	volts	▨		▨	▨	▨
B.31 (B.26)	Time for SXT shaft tachometer signal to reach steady-state	sec.	▨		0.5		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 10715
REV. A

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.31 (B.27.a)	Time for SCT shaft 1X resolver error signal to reach steady-state	sec.	▨		2.5		
B.31 (B.27.b)	Time for SCT SHAFT 1X resolver error signal to reach steady-state	sec.	▨		6		
B.31 (B.28.a)	Time for SHAFT ANGLE CDU 16X resolver error signal to reach first zero cross-over	sec.	▨		2.5		
B.31 (B.28.b)	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		6		
B.44.a	SCT shaft tachometer maximum variation	mv (peak-to-peak)	▨		▨	▨	▨
B.44.b	SHAFT ANGLE CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.44.c	SXT shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.45.a	SCT shaft tachometer Load Disturbance	+ 1/2 P millisec	▨		▨	▨	▨
		-1/2 P millisec	▨		▨	▨	▨

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 10715
REV. 1

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.45.b	SHAFT ANGLE CDU tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.45.c	SXT shaft tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.49 (B.44.a)	SCT shaft tachometer maximum variation	mv (peak-to-peak)	▨		▨	▨	▨
B.49 (B.44.b)	SHAFT ANGLE CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49 (B.44.c)	SXT Shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49 (B.45.a)	SCT shaft tachometer Load Disturbance	+1/2 P millisec	▨		▨	▨	▨
		-1/2 P millisec	▨		▨	▨	▨
B.49 (B.45.b)	SHAFT ANGLE CDU tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.49 (B.45.c)	SXT shaft tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		

DATE ______

Released with ATP 1009502
JOB SHAFT SERVO LOOP TEST
JDC 10715 REV. B PAGE 1 OF 5
INITIAL TDRR 19950 D.S. PGS 4

SUBSYSTEM OPTICAL
ASSY.

DESCRIPTION Minimum rate, smoothness, dynamic response and velocity error for shaft servo loop are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22227	All	All	WK[illegible]	TM[illegible]
B	11-24-65	24349	All	3	WK[illegible]	-

REFERENCES ATP 1009502, Paragraph 3-3.11, JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON
OPTICS POWER ON
BLOCK 1 SERIES 100.

NOTE: Assure that the Oscillograph Console and Digital Voltmeter (DVM) have been energized a minimum of 15 minutes immediately prior to use in this test.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

ZERO OPTICS
CONTROLLER DIRECT
SCT DRIVE NORMAL
SXT DRIVE NORMAL

4. Assure that the following pushbuttons are not lighted:

TRACKER
TRACKER POWER.

5. Set switches as follows:

SHAFT SLEW CONTROL to OFF
TRUNNION SLEW CONTROL to OFF
SLAVE TELESCOPE to STAR LOS
COARSE GAIN CONTROL to MED.

6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 11 JUN 65

JOB SHAFT SERVO LOOP TEST
JDC 10715 REV B PAGE 2 OF 5
SUBSYSTEM OPTICAL
ASSY

7. Connect the SXT Shaft MDA Input to the DVM by setting the Primary Signal Selector to 203.

8. Set switches on Oscillograph Signal Selector panel as follows:

a. CHANNEL 1 to 8 (SXT shaft MDA Output)

b. CHANNEL 2 to 13 (SXT shaft MDA input)

c. CHANNEL 3 to 13 (SHAFT ANGLE CDU tachometer)

d. CHANNEL 4 to 13 (SCT shaft 1X resolver error)

e. CHANNEL 5 to 10 (SHAFT ANGLE CDU 16X resolver error)

f. CHANNEL 6 to 10 (SXT shaft tachometer).

9. Assure that the following indicators are lighted:

800~ 0 PH REFERENCE
CH 3 AC
CH 4 AC
CH 5 AC
CH 6 AC.

10. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 100 MV/MM
CHANNEL 2 - 100 MV/MM
CHANNEL 3 - 100 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 100 MV/MM.

NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

11. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

B. PROCEDURE

1. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

2. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

3. Set SHAFT SLEW CONTROL switch to INCR.

4. Adjust FINE GAIN CONTROL until DVM indicates approximately 0.606 volts. Record DVM voltage indication.

5. Perform following steps in sequence:

a. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

b. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.

c. Approximately 10 seconds after performing step B.5.b, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

DATE 11 JUN 65

JOB SHAFT SERVO LOOP TEST
JDC 10715 REV B PAGE 3 OF 5
SUBSYSTEM OPTICAL
ASSY

NOTE: The "steady state" signal is defined as the average value of that signal obtained after the initial transients die out. To find the average value of the signal, it may be necessary to take the average of approximately twenty equally spaced (in time) readings over approximately two seconds of the steady state signal.

6. Record SHAFT ANGLE CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 5).

7. Set SHAFT SLEW CONTROL switch on the Remote Optics Controller to DECR.

8. Record DVM voltage indication.

9. Repeat step B.5.

10. Record SHAFT ANGLE CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 5).

11. Press the MANUAL/ZERO OPTICS and SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbuttons on the Remote Optics Controller to light the ZERO OPTICS and SXT DRIVE NORMAL indicators.

12. After the CDU's have zeroed, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED and MANUAL/ZERO OPTICS pushbuttons to light the SXT DRIVE DISABLED and MANUAL indicators.

13. Set switches as follows:

COARSE GAIN CONTROL to HI
SHAFT SLEW CONTROL to INCR.

14. Adjust the FINE GAIN CONTROL until DVM indicates approximately 1.82 volts. Record DVM voltage indication.

15. Set the following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 200 MV/MM
CHANNEL 2 - 200 MV/MM
CHANNEL 3 - 200 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 5 MV/MM
CHANNEL 6 - 200 MV/MM.

16. Repeat step B.5.

17. Record SCT Shaft 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

18. Repeat steps B.7 and B.8.

19. Repeat step B.5.

20. Record SCT Shaft 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

21. Repeat steps B.11 and B.12.

22. Set SHAFT SLEW CONTROL switch to INCR.

23. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

24. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 1000 MV/MM
CHANNEL 2 - 500 MV/MM

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JOB SHAFT SERVO LOOP TEST
JDC 10715 REV B PAGE 4 OF 5
SUBSYSTEM OPTICAL
ASSY

CHANNEL 3 - 1000 MV/MM
CHANNEL 4 - 50 MV/MM
CHANNEL 5 - 50 MV/MM
CHANNEL 6 - 1000 MV/MM.

25. Repeat step B.5.

26. Record time for the SXT shaft tachometer output to reach steady state, from Oscillograph Chart (CHANNEL 6).

27. Record time for the SCT shaft 1X resolver error to reach (a) the first zero crossover, and (b) steady state, from Oscillograph Chart (CHANNEL 4).

28. Record time for the SHAFT ANGLE CDU 16X resolver error to reach (a) the first zero crossover, and (b) steady state, from Oscillograph Chart (CHANNEL 5).

29. Set SHAFT SLEW CONTROL switch on the Remote Optics Controller to DECR.

30. Record DVM voltage indication.

31. Repeat steps B.5, B.26, B.27 and B.28.

32. Set the COARSE GAIN CONTROL switch on the Remote Optics Controller to LO and the FINE GAIN CONTROL fully counterclockwise.

33. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 20 MV/MM
CHANNEL 2 - 1 MV/MM
CHANNEL 3 - 1 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 1 MV/MM.

34. Set the FILTER switches on CHANNEL 4, CHANNEL 5, and CHANNEL 6 DEMOD's to LO.

35. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

36. Set CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 (SCT shaft tachometer).

37. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

38. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

39. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

40. Set the SHAFT SLEW CONTROL switch on either INCR or DECR as necessary, and adjust FINE GAIN CONTROL until the SHAFT ANGLE CDU stops moving. Determine value of SXT shaft tachometer signal from CHANNEL 6 of the Oscillograph Chart.

NOTE: Deflection of the Oscillograph to the right indicates an increasing signal.

41. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 6 until its nominal value is 7 millivolts above the value determined in step B.40.

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SUBSYSTEM OPTICAL | ASSY

42. Press CHART SPEEDS 20 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

43. Set the SHAFT SLEW CONTROL switch to OFF.

44. Record the maximum peak-to-peak variation in the Servo Velocity Signal (see Figure 1) of the following:

a. SCT shaft tachometer (CHANNEL 1)

b. SHAFT ANGLE CDU tachometer (CHANNEL 3)

c. SXT shaft tachometer (CHANNEL 6).

45. Record the signal width of the Load Disturbance Signal (see Figure 1) at approximately 1/2 positive peak and 1/2 negative peak of the following:

a. SCT shaft tachometer (CHANNEL 1)

b. SHAFT ANGLE CDU tachometer (CHANNEL 3)

c. SXT shaft tachometer (CHANNEL 6)

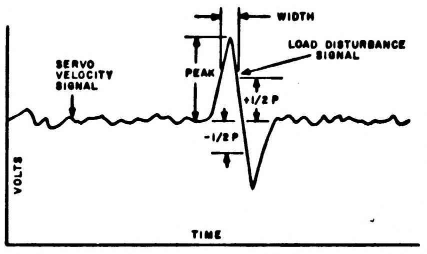

Figure 1

Tachometer Signals During Smoothness Test

46. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

47. Using the SHAFT SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 6 until its nominal value is 7 millivolts below the value determined in step B.40.

48. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

49. Set the SHAFT SLEW CONTROL switch to OFF.

50. Repeat step B.44.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 10715
REV. B
INITIAL TDRR 19950

JOB SHAFT SERVO LOOP TEST

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ________ DWG ________ REV. ________

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE

NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION   APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	DVM input voltage indication	volts	▨		▨	▨	▨
B.6	SHAFT ANGLE CDU 16X resolver error output	mv	▨		4		
B.8	DVM input voltage indication	volts	▨		▨	▨	▨
B.10	SHAFT ANGLE CDU 16X resolver error output	mv	▨		4		
B.14	DVM input voltage indication	volts	▨		▨	▨	▨
B.18	SCT Shaft 1X resolver error output	mv	▨		40		
B.19 (B.8)	DVM input voltage indication	volts	▨		▨	▨	▨
B.20	SCT Shaft 1X resolver error output	mv	▨		40		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 10715
REV. B

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.23	DVM input voltage indication	volts	▨		▨	▨	▨
B.26	Time for SXT shaft tachometer signal to reach steady-state	sec.	▨		0.5		
B.27.a	Time for SCT 1X resolver error signal to reach first zero cross-over	sec.	▨		2.5		
B.27.b	Time for SCT 1X resolver error signal to reach steady-state	sec.	▨		6		
B.28.a	Time for SHAFT ANGLE CDU 16X resolver error signal to reach first zero cross-over	sec.	▨		2.5		
B.28.b	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		6		
B.30	DVM input voltage indication	volts	▨		▨	▨	▨
B.31 (B.26)	Time for SXT shaft tachometer signal to reach steady-state	sec.	▨		0.5		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 10715
REV. B

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.31 (B.27.a)	Time for SCT shaft 1X resolver error signal to reach steady-state	sec.	▨		2.5		
B.31 (B.27.b)	Time for SCT SHAFT 1X resolver error signal to reach steady-state	sec.	▨		6		
B.31 (B.28.a)	Time for SHAFT ANGLE CDU 16X resolver error signal to reach first zero cross-over	sec.	▨		2.5		
B.31 (B.28.b)	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		6		
B.44.a	SCT shaft tachometer maximum variation	mv (peak-to-peak)	▨		▨	▨	▨
B.44.b	SHAFT ANGLE CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.44.c	SXT shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.45.a	SCT shaft tachometer Load Disturbance	+1/2 P millisec	▨		▨	▨	▨
		-1/2 P millisec	▨		▨	▨	▨

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 10715
REV. B

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.45.b	SHAFT ANGLE CDU tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.45.c	SXT shaft tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.49 (B.44. a)	SCT shaft tachometer maximum variation	mv (peak-to-peak)	▨		▨	▨	▨
B.49 (B.44. b)	SHAFT ANGLE CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49 (B.44. c)	SXT Shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49 (B.45. a)	SCT shaft tachometer Load Disturbance	+1/2 P millisec	▨		▨	▨	▨
		-1/2 P millisec	▨		▨	▨	▨
B.49 (B.45. b)	SHAFT ANGLE CDU tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.49 (B.45. c)	SXT shaft tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		

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Released with ATP 1009502

JOB SHAFT SERVO LOOP TEST

JDC 10715 **REV.** C **PAGE** 1 **OF** 5

INITIAL TDRR 19950 **D.S. P3S** 4

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Minimum rate, smoothness, dynamic response and velocity error for shaft servo loop are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
M A	9-1-65	22227	All	All	WK	TM
Ⓜ B	11-24-65	24349	All	3	WK	-
C	12-28-65	24918	-	3	WK	-

REFERENCES ATP 1009502, Paragraph 3-3.11, JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON
OPTICS POWER ON
BLOCK 1 SERIES 100.

NOTE: Assure that the Oscillograph Console and Digital Voltmeter (DVM) have been energized a minimum of 15 minutes immediately prior to use in this test.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

ZERO OPTICS
CONTROLLER DIRECT
SCT DRIVE NORMAL
SXT DRIVE NORMAL

4. Assure that the following pushbuttons are not lighted:

TRACKER
TRACKER POWER.

5. Set switches as follows:

SHAFT SLEW CONTROL to OFF
TRUNNION SLEW CONTROL to OFF
SLAVE TELESCOPE to STAR LOS
COARSE GAIN CONTROL to MED.

6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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7. Connect the SXT Shaft MDA Input to the DVM by setting the Primary Signal Selector to 203.

8. Set switches on Oscillograph Signal Selector panel as follows:

a. CHANNEL 1 to 8 (SXT shaft MDA Output)

b. CHANNEL 2 to 13 (SXT shaft MDA input)

c. CHANNEL 3 to 13 (SHAFT ANGLE CDU tachometer)

d. CHANNEL 4 to 13 (SCT shaft 1X resolver error)

e. CHANNEL 5 to 10 (SHAFT ANGLE CDU 16X resolver error)

f. CHANNEL 6 to 10 (SXT shaft tachometer).

9. Assure that the following indicators are lighted:

800~ 0 PH REFERENCE
CH 3 AC
CH 4 AC
CH 5 AC
CH 6 AC.

10. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 100 MV/MM
CHANNEL 2 - 100 MV/MM
CHANNEL 3 - 100 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 100 MV/MM.

NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

11. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

B. PROCEDURE

1. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

2. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

3. Set SHAFT SLEW CONTROL switch to INCR.

4. Adjust FINE GAIN CONTROL until DVM indicates approximately 0.606 volts. Record DVM voltage indication.

5. Perform following steps in sequence:

a. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

b. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.

c. Approximately 10 seconds after performing step B.5.b, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

NOTE: The "steady state" signal is defined as the average value of that signal obtained after the initial transients die out. To find the average value of the signal, it may be necessary to take the average of approximately twenty equally spaced (in time) readings over approximately two seconds of the steady state signal.

6. Record SHAFT ANGLE CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 5).

7. Set SHAFT SLEW CONTROL switch on the Remote Optics Controller to DECR.

8. Record DVM voltage indication.

9. Repeat step B.5.

10. Record SHAFT ANGLE CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 5).

11. Press the MANUAL/ZERO OPTICS and SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbuttons on the Remote Optics Controller to light the ZERO OPTICS and SXT DRIVE NORMAL indicators.

12. After the CDU's have zeroed, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED and MANUAL/ZERO OPTICS pushbuttons to light the SXT DRIVE DISABLED and MANUAL indicators.

13. Set switches as follows:

COARSE GAIN CONTROL to HI
SHAFT SLEW CONTROL to INCR.

14. Adjust the FINE GAIN CONTROL until DVM indicates approximately 1.82 volts. Record DVM voltage indication.

15. Set the following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 200 MV/MM
CHANNEL 2 - 200 MV/MM
CHANNEL 3 - 200 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 5 MV/MM
CHANNEL 6 - 200 MV/MM.

16. Repeat step B.5.

17. Record SCT Shaft 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

18. Repeat steps B.7 and B.8.

19. Repeat step B.5.

20. Record SCT Shaft 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

21. Repeat steps B.11 and B.12.

22. Set SHAFT SLEW CONTROL switch to INCR.

23. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

24. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 1000 MV/MM
CHANNEL 2 - 500 MV/MM

CHANNEL 3 - 1000 MV/MM
CHANNEL 4 - 50 MV/MM
CHANNEL 5 - 50 MV/MM
CHANNEL 6 - 1000 MV/MM.

25. Repeat step B.5.

26. Record time for the SXT shaft tachometer output to reach steady state, from Oscillograph Chart (CHANNEL 6).

27. Record time for the SCT shaft 1X resolver error to reach (a) the first zero crossover, and (b) steady state, from Oscillograph Chart (CHANNEL 4).

28. Record time for the SHAFT ANGLE CDU 16X resolver error to reach (a) the first zero crossover, and (b) steady state, from Oscillograph Chart (CHANNEL 5).

29. Set SHAFT SLEW CONTROL switch on the Remote Optics Controller to DECR.

30. Record DVM voltage indication.

31. Repeat steps B.5, B.26, B.27 and B.28.

32. Set the COARSE GAIN CONTROL switch on the Remote Optics Controller to LO and the FINE GAIN CONTROL fully counterclockwise.

33. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 20 MV/MM
CHANNEL 2 - 1 MV/MM
CHANNEL 3 - 1 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 1 MV/MM.

34. Set the FILTER switches on CHANNEL 4, CHANNEL 5, and CHANNEL 6 DEMOD's to LO.

35. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

36. Set CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 (SCT shaft tachometer).

37. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

38. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

39. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

40. Set the SHAFT SLEW CONTROL switch on either INCR or DECR as necessary, and adjust FINE GAIN CONTROL until the SHAFT ANGLE CDU stops moving. Determine value of SXT shaft tachometer signal from CHANNEL 6 of the Oscillograph Chart.

NOTE: Deflection of the Oscillograph to the right indicates an increasing signal.

41. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 6 until its nominal value is 7 millivolts above the value determined in step B.40.

JOB SHAFT SERVO LOOP TEST | JDC 10715 REV C PAGE 5 OF 5

SUBSYSTEM OPTICAL | ASSY

42. Press CHART SPEEDS 20 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

43. Set the SHAFT SLEW CONTROL switch to OFF.

44. Record the maximum peak-to-peak variation in the Servo Velocity Signal (see Figure 1) of the following:

- a. SCT shaft tachometer (CHANNEL 1)
- b. SHAFT ANGLE CDU tachometer (CHANNEL 3)
- c. SXT shaft tachometer (CHANNEL 6).

45. Record the signal width of the Load Disturbance Signal (see Figure 1) at approximately 1/2 positive peak and 1/2 negative peak of the following:

- a. SCT shaft tachometer (CHANNEL 1)
- b. SHAFT ANGLE CDU tachometer (CHANNEL 3)
- c. SXT shaft tachometer (CHANNEL 6)

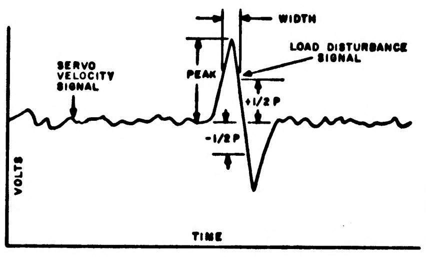

Figure 1

Tachometer Signals During Smoothness Test

46. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

47. Using the SHAFT SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 6 until its nominal value is 7 millivolts below the value determined in step B.40.

48. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

49. Set the SHAFT SLEW CONTROL switch to OFF.

50. Repeat step B.44.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 10715
REV. C
INITIAL TDRR 19950

JOB SHAFT SERVO LOOP TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	DVM input voltage indication	volts	▨		▨	▨	▨
B.6	SHAFT ANGLE CDU 16X resolver error output	mv	▨		4		
B.8	DVM input voltage indication	volts	▨		▨	▨	▨
B.10	SHAFT ANGLE CDU 16X resolver error output	mv	▨		4		
B.14	DVM input voltage indication	volts	▨		▨	▨	▨
B.18	SCT Shaft 1X resolver error output	mv	▨		40		
B.19 (B.8)	DVM input voltage indication	volts	▨		▨	▨	▨
B.20	SCT Shaft 1X resolver error output	mv	▨		40		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 10715
REV. C

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.23	DVM input voltage indication	volts	▨		▨	▨	▨
B.26	Time for SXT shaft tachometer signal to reach steady-state	sec.	▨		0.5		
B.27.a	Time for SCT 1X resolver error signal to reach first zero crossover	sec.	▨		2.5		
B.27.b	Time for SCT 1X resolver error signal to reach steady-state	sec.	▨		6		
B.28.a	Time for SHAFT ANGLE CDU 16X resolver error signal to reach first zero crossover	sec.	▨		2.5		
B.28.b	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		6		
B.30	DVM input voltage indication	volts	▨		▨	▨	▨
B.31 (B.26)	Time for SXT shaft tachometer signal to reach steady-state	sec.	▨		0.5		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 10715
REV. C

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.31 (B.27.a)	Time for SCT shaft 1X resolver error signal to reach first zero crossover	sec.	▨		2.5		
B.31 (B.27.b)	Time for SCT SHAFT 1X resolver error signal to reach steady-state	sec.	▨		6		
B.31 (B.28.a)	Time for SHAFT ANGLE CDU 16X resolver error signal to reach first zero crossover	sec.	▨		2.5		
B.31 (B.28.b)	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		6		
B.44.a	SCT shaft tachometer maximum variation	mv (peak-to-peak)	▨		▨	▨	▨
B.44.b	SHAFT ANGLE CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.44.c	SXT shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.45.a	SCT shaft tachometer Load Disturbance	+1/2 P millisec	▨		▨	▨	▨
		-1/2 P millisec	▨		▨	▨	▨

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EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 10715
REV. C

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.45.b	SHAFT ANGLE CDU tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.45.c	SXT shaft tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.49 (B.44.a)	SCT shaft tachometer maximum variation	mv (peak-to-peak)	▨		▨	▨	▨
B.49 (B.44.b)	SHAFT ANGLE CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49 (B.44.c)	SXT Shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49 (B.45.a)	SCT shaft tachometer Load Disturbance	+1/2 P millisec	▨		▨	▨	▨
		-1/2 P millisec	▨		▨	▨	▨
B.49 (B.45.b)	SHAFT ANGLE CDU tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.49 (B.45.c)	SXT shaft tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		

DATE 11 JUN 65

Released with ATP 1009502

JOB SHAFT SERVO LOOP TEST	**JDC** 10715 **REV.** D **PAGE** 1 **OF** 5
	INITIAL TDRR 19950 **D.S. PGS** 4
SUBSYSTEM OPTICAL	**ASSY.**

DESCRIPTION Minimum rate, smoothness, dynamic response and velocity error for shaft servo loop are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22227	All	All	WK	TM
B	11-24-65	24349	All	3	WK	-
C	12-28-65	24918	-	3	WK	-
D	2-1-66	25869	-	2,3	WK	ACM

REFERENCES ATP 1009502, Paragraph 3-3.11, JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

OIA ON
OPTICS POWER ON
BLOCK 1 SERIES 100.

NOTE: Assure that the Oscillograph Console and Digital Voltmeter (DVM) have been energized a minimum of 15 minutes immediately prior to use in this test.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

ZERO OPTICS
CONTROLLER DIRECT
SCT DRIVE NORMAL
SXT DRIVE NORMAL

4. Assure that the following pushbuttons are not lighted:

TRACKER
TRACKER POWER.

5. Set switches as follows:

SHAFT SLEW CONTROL to OFF
TRUNNION SLEW CONTROL to OFF
SLAVE TELESCOPE to STAR LOS
COARSE GAIN CONTROL to MED.

6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

7. Connect the SXT Shaft MDA Input to the DVM by setting the Primary Signal Selector to 203.

8. Set switches on Oscillograph Signal Selector panel as follows:

a. CHANNEL 1 to 8 (SXT shaft MDA Output)

b. CHANNEL 2 to 13 (SXT shaft MDA input)

c. CHANNEL 3 to 13 (SHAFT ANGLE CDU tachometer)

d. CHANNEL 4 to 13 (SCT shaft 1X resolver error)

e. CHANNEL 5 to 10 (SHAFT ANGLE CDU 16X resolver error)

f. CHANNEL 6 to 10 (SXT shaft tachometer).

9. Assure that the following indicators are lighted:

800~ 0 PH REFERENCE
CH 3 AC
CH 4 AC
CH 5 AC
CH 6 AC.

10. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 100 MV/MM
CHANNEL 2 - 100 MV/MM
CHANNEL 3 - 100 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 100 MV/MM.

NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

11. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

B. PROCEDURE

1. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

2. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

3. Set SHAFT SLEW CONTROL switch to INCR.

4. Adjust FINE GAIN CONTROL until DVM indicates approximately 0.606 volts. Record DVM voltage indication.

5. Perform following steps in sequence:

a. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

b. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.

c. Approximately 10 seconds after performing step B.5.b, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

NOTE: The "steady state" signal is defined as the average value of that signal obtained after the initial transients die out. To find the average value of the signal, it may be necessary to take the average of approximately twenty equally spaced (in time) readings over approximately two seconds of the steady state signal.

6. Record SHAFT ANGLE CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 5).

7. Set SHAFT SLEW CONTROL switch on the Remote Optics Controller to DECR.

8. Record DVM voltage indication.

9. Repeat step B.5.

10. Record SHAFT ANGLE CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 5).

11. Press the MANUAL/ZERO OPTICS and SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbuttons on the Remote Optics Controller to light the ZERO OPTICS and SXT DRIVE NORMAL indicators.

12. After the CDU's have zeroed, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED and MANUAL/ZERO OPTICS pushbuttons to light the SXT DRIVE DISABLED and MANUAL indicators.

13. Set switches as follows:

COARSE GAIN CONTROL to HI
SHAFT SLEW CONTROL to INCR.

14. Adjust the FINE GAIN CONTROL until DVM indicates approximately 1.82 volts. Record DVM voltage indication.

15. Set the following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 200 MV/MM
CHANNEL 2 - 200 MV/MM
CHANNEL 3 - 200 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 5 MV/MM
CHANNEL 6 - 200 MV/MM.

16. Repeat step B.5.

17. Record SCT Shaft 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

18. Repeat steps B.7 and B.8.

19. Repeat step B.5.

20. Record SCT Shaft 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

21. Repeat steps B.11 and B.12.

22. Set SHAFT SLEW CONTROL switch to INCR.

23. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

24. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 1000 MV/MM
CHANNEL 2 - 500 MV/MM

CHANNEL 3 - 1000 MV/MM
CHANNEL 4 - 50 MV/MM
CHANNEL 5 - 50 MV/MM
CHANNEL 6 - 1000 MV/MM.

25. Repeat step B.5.

26. Record time for the SXT shaft tachometer output to reach steady state, from Oscillograph Chart (CHANNEL 6).

27. Record time for the SCT shaft 1X resolver error to reach (a) the first zero crossover, and (b) steady state, from Oscillograph Chart (CHANNEL 4).

28. Record time for the SHAFT ANGLE CDU 16X resolver error to reach (a) the first zero crossover, and (b) steady state, from Oscillograph Chart (CHANNEL 5).

29. Set SHAFT SLEW CONTROL switch on the Remote Optics Controller to DECR.

30. Record DVM voltage indication.

31. Repeat steps B.5, B.26, B.27 and B.28.

32. Set the COARSE GAIN CONTROL switch on the Remote Optics Controller to LO and the FINE GAIN CONTROL fully counterclockwise.

33. Set following sensitivities on Oscillograph Amplifier panels:

CHANNEL 1 - 20 MV/MM
CHANNEL 2 - 1 MV/MM
CHANNEL 3 - 1 MV/MM
CHANNEL 4 - 1 MV/MM
CHANNEL 5 - 1 MV/MM
CHANNEL 6 - 1 MV/MM.

34. Set the FILTER switches on CHANNEL 4, CHANNEL 5, and CHANNEL 6 DEMOD's to LO.

35. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

36. Set CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 (SCT shaft tachometer).

37. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

38. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

39. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

40. Set the SHAFT SLEW CONTROL switch on either INCR or DECR as necessary, and adjust FINE GAIN CONTROL until the SHAFT ANGLE CDU stops moving. Determine value of SXT shaft tachometer signal from CHANNEL 6 of the Oscillograph Chart.

NOTE: Deflection of the Oscillograph to the right indicates an increasing signal.

41. Using the FINE GAIN CONTROL on the Remote Optics Controller, increase the tachometer signal on CHANNEL 6 until its nominal value is 7 millivolts above the value determined in step B.40.

42. Press CHART SPEEDS 20 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

43. Set the SHAFT SLEW CONTROL switch to OFF.

44. Record the maximum peak-to-peak variation in the Servo Velocity Signal (see Figure 1) of the following:

a. SCT shaft tachometer (CHANNEL 1)

b. SHAFT ANGLE CDU tachometer (CHANNEL 3)

c. SXT shaft tachometer (CHANNEL 6).

45. Record the signal width of the Load Disturbance Signal (see Figure 1) at approximately 1/2 positive peak and 1/2 negative peak of the following:

a. SCT shaft tachometer (CHANNEL 1)

b. SHAFT ANGLE CDU tachometer (CHANNEL 3)

c. SXT shaft tachometer (CHANNEL 6)

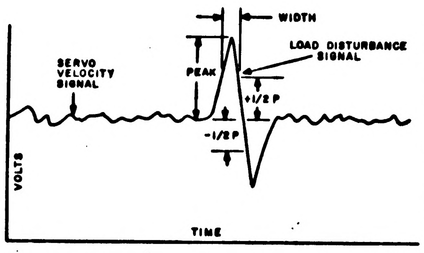

Figure 1

Tachometer Signals During Smoothness Test

46. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

47. Using the SHAFT SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 6 until its nominal value is 7 millivolts below the value determined in step B.40.

48. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

49. Set the SHAFT SLEW CONTROL switch to OFF.

50. Repeat step B.44.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 10715
REV. D
INITIAL TDRR 19950

JOB SHAFT SERVO LOOP TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	DVM input voltage indication	volts	▨		▨	▨	▨
B.6	SHAFT ANGLE CDU 16X resolver error output	mv	▨		4		
B.8	DVM input voltage indication	volts	▨		▨	▨	▨
B.10	SHAFT ANGLE CDU 16X resolver error output	mv	▨		4		
B.14	DVM input voltage indication	volts	▨		▨	▨	▨
B.18	SCT Shaft 1X resolver error output	mv	▨		40		
B.19 (B.8)	DVM input voltage indication	volts	▨		▨	▨	▨
B.20	SCT Shaft 1X resolver error output	mv	▨		40		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 10715
REV. D

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.23	DVM input voltage indication	volts	▨		▨	▨	▨
B.26	Time for SXT shaft tachometer signal to reach steady-state	sec.	▨		0.5		
B.27.a	Time for SCT 1X resolver error signal to reach first zero crossover	sec.	▨		2.5		
B.27.b	Time for SCT 1X resolver error signal to reach steady-state	sec.	▨		6		
B.28.a	Time for SHAFT ANGLE CDU 16X resolver error signal to reach first zero crossover	sec.	▨		3.0		
B.28.b	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		6		
B.30	DVM input voltage indication	volts	▨		▨	▨	▨
B.31 (B.26)	Time for SXT shaft tachometer signal to reach steady-state	sec.	▨		0.5		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 10715
REV. D

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.31 (B.27.a)	Time for SCT shaft 1X resolver error signal to reach first zero crossover	sec.	▨		2.5		
B.31 (B.27.b)	Time for SCT SHAFT 1X resolver error signal to reach steady-state	sec.	▨		6		
B.31 (B.28.a)	Time for SHAFT ANGLE CDU 16X resolver error signal to reach first zero crossover	sec.	▨		3.0		
B.31 (B.28.b)	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		6		
B.44.a	SCT shaft tachometer maximum variation	mv (peak-to-peak)	▨		▨	▨	▨
B.44.b	SHAFT ANGLE CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.44.c	SXT shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.45.a	SCT shaft tachometer Load Disturbance	+ 1/2 P millisec	▨		▨	▨	▨
		-1/2 P millisec	▨		▨	▨	▨

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 10715
REV. D

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.45.b	SHAFT ANGLE CDU tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.45.c	SXT shaft tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.49 (B.44. a)	SCT shaft tachometer maximum variation	mv (peak-to-peak)	▨		▨	▨	▨
B.49 (B.44. b)	SHAFT ANGLE CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49 (B.44. c)	SXT Shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49 (B.45. a)	SCT shaft tachometer Load Disturbance	+1/2 P millisec	▨		▨	▨	▨
		-1/2 P millisec	▨		▨	▨	▨
B.49 (B.45. b)	SHAFT ANGLE CDU tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		
B.49 (B.45. c)	SXT shaft tachometer Load Disturbance	+1/2 P millisec	▨		250		
		-1/2 P millisec	▨		250		

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JOB SHAFT SERVO LOOP TEST

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INITIAL TDRR 19950 **D.S. PGS** 3

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Minimum rate, smoothness, dynamic response and velocity error for shaft servo loop are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ATP 1009502, Paragraph 3-3.11, JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the Remote Optics Controller is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

    OIA ON/ISS POWER DISABLED
    OPTICS POWER ON
    BLOCK 1 SERIES 100.

    NOTE: Assure that the Oscillograph Console and Digital Voltmeter (DVM) have been energized a minimum of 15 minutes immediately prior to use in this test.

3. Assure that the following pushbutton and indicators on the Remote Optics Controller are lighted:

    MANUAL
    CONTROLLER DIRECT
    SCT DRIVE NORMAL
    SXT DRIVE DISABLED.

4. Assure that the following pushbuttons are not lighted:

    TRACKER
    TRACKER POWER.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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5. Set switches as follows:

    SHAFT SLEW CONTROL to OFF
    TRUNNION SLEW CONTROL to OFF
    SLAVE TELESCOPE to STAR LOS
    COARSE GAIN CONTROL to MED.

6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to OFF.

7. Connect the SXT Shaft MDA Input to the DVM by setting the Primary Signal Selector to 203.

8. Press the MANUAL/ZERO OPTICS pushbutton to light the ZERO OPTICS indicator.

9. Set switches on Oscillograph Signal Selector panel as follows:

    a. CHANNEL 1 to 8 (SXT shaft MDA Output)
    b. CHANNEL 2 to 13 (SXT shaft MDA input)
    c. CHANNEL 3 to 13 (SHAFT ANGLE CDU tachometer)
    d. CHANNEL 4 to 13 (SCT shaft 1X resolver error)
    e. CHANNEL 5 to 10 (SHAFT ANGLE CDU 16X resolver error)
    f. CHANNEL 6 to 10 (SXT shaft tachometer).

10. Assure that the following indicators are lighted:

    800~0 PH REFERENCE
    CH 3 AC
    CH 4 AC
    CH 5 AC
    CH 6 AC.

11. Set following sensitivities on Oscillograph Amplifier panels:

    CHANNEL 1 - 100 MV/MM
    CHANNEL 2 - 100 MV/MM
    CHANNEL 3 - 100 MV/MM
    CHANNEL 4 - 1 MV/MM
    CHANNEL 5 - 1 MV/MM
    CHANNEL 6 - 100 MV/MM.

    NOTE: Oscillograph sensitivities given are nominal and may be adjusted at the discretion of the operator.

12. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

B. PROCEDURE

1. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the MANUAL indicator.

2. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.

3. Set SHAFT SLEW CONTROL switch to INCR.

4. Adjust FINE GAIN CONTROL until DVM indicates approximately 0.606 volts. Record DVM voltage indication.

DATE ______

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5. Perform following steps in sequence:

    a. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.
    b. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton on the Remote Optics Controller to light the SXT DRIVE NORMAL indicator.
    c. Approximately 10 seconds after performing step B.5.b, press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE DISABLED indicator.
    d. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR.

6. Record SHAFT ANGLE CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 5).

7. Set SHAFT SLEW CONTROL switch on the Remote Optics Controller to DECR.

8. Record DVM voltage indication.

9. Repeat step B.5.

10. Record SHAFT ANGLE CDU 16X resolver error steady state signal from Oscillograph Chart (CHANNEL 5).

11. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

12. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

13. Set switches as follows:

    COARSE GAIN CONTROL to HI
    SHAFT SLEW CONTROL to INCR.

14. Adjust the FINE GAIN CONTROL until DVM indicates approximately 1.82 volts. Record DVM voltage indication.

15. Set the following sensitivities on Oscillograph Amplifier panels:

    CHANNEL 1 - 200 MV/MM
    CHANNEL 2 - 200 MV/MM
    CHANNEL 3 - 200 MV/MM
    CHANNEL 4 - 1 MV/MM
    CHANNEL 5 - 5 MV/MM
    CHANNEL 6 - 200 MV/MM.

16. Repeat step B.5.

17. Record SCT Shaft 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

18. Repeat steps B.7 and B.8.

19. Repeat step B.5.

20. Record SCT Shaft 1X resolver error steady state signal from Oscillograph Chart (CHANNEL 4).

21. Repeat steps B.11 and B.12.

22. Set SHAFT SLEW CONTROL switch to INCR.

23. Adjust the FINE GAIN CONTROL until DVM indicates approximately 10.00 volts. Record DVM voltage indication.

DATE ______

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24. Set following sensitivities on Oscillograph Amplifier panels:

    CHANNEL 1 - 1000 MV/MM
    CHANNEL 2 - 500 MV/MM
    CHANNEL 3 - 1000 MV/MM
    CHANNEL 4 - 10 MV/MM
    CHANNEL 5 - 10 MV/MM
    CHANNEL 6 - 1000 MV/MM.

25. Repeat step B.5.

26. Record time for the SXT shaft tachometer output to reach steady state, from Oscillograph Chart (CHANNEL 6).

27. Record time for the SCT shaft 1X resolver error to reach steady state, from Oscillograph Chart (CHANNEL 4).

28. Record time for the SHAFT ANGLE CDU 16X resolver error to reach steady state, from Oscillograph Chart (CHANNEL 5).

29. Set SHAFT SLEW CONTROL switch on the Remote Optics Controller to DECR.

30. Record DVM voltage indication.

31. Repeat steps B.5, B.26, B.27 and B.28.

32. Set the COARSE GAIN CONTROL switch on the Remote Optics Controller to LO and the FINE GAIN CONTROL fully counterclockwise.

33. Set following sensitivities on Oscillograph Amplifier panels:

    CHANNEL 1 - 20 MV/MM
    CHANNEL 2 - 1 MV/MM
    CHANNEL 3 - 1 MV/MM
    CHANNEL 4 - 1 MV/MM
    CHANNEL 5 - 1 MV/MM
    CHANNEL 6 - 1 MV/MM.

34. Set the FILTER switches on CHANNEL 4, CHANNEL 5, and CHANNEL 6 DEMOD's to LO.

35. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

36. Set CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 (SCT shaft tachometer).

37. Press the MANUAL/ZERO OPTICS pushbutton on the Remote Optics Controller to light the ZERO OPTICS indicator.

38. After the CDU's have zeroed, press the MANUAL/ZERO OPTICS pushbutton to light the MANUAL indicator.

39. Press the SXT DRIVE NORMAL/SXT DRIVE DISABLED pushbutton to light the SXT DRIVE NORMAL indicator.

40. Set the SHAFT SLEW CONTROL switch to either INCR or DECR as necessary, and adjust FINE GAIN CONTROL until the SHAFT ANGLE CDU stops moving. Determine value of SXT shaft tachometer signal from CHANNEL 6 of the Oscillograph chart.

    NOTE: Deflection of the Oscillograph to the right indicates an increasing signal.

41. Using the FINE GAIN CONTROL on the

DATE ______

JOB SHAFT SERVO LOOP TEST | **JDC** 10715 **REV** | **PAGE** 5 **OF** 5

SUBSYSTEM OPTICAL | **ASSY**

Remote Optics Controller, increase the tachometer signal on CHANNEL 6 until its nominal value is 7 millivolts above the value determined in step B. 40.

42. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

43. Set the SHAFT SLEW CONTROL switch to OFF.

44. Record the maximum peak-to-peak variation of the following signals:
   a. SCT shaft tachometer (CHANNEL 1)
   b. SHAFT ANGLE CDU tachometer (CHANNEL 3)
   c. SXT shaft tachometer (CHANNEL 6).

45. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

46. Using the SHAFT SLEW CONTROL switch and the FINE GAIN CONTROL on the Remote Optics Controller, decrease the tachometer signal on CHANNEL 6 until its nominal value is 7 millivolts below the value determined in step B. 40.

47. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and allow chart to drive for approximately one minute. Set the CHART DRIVE switch to OFF.

48. Set the SHAFT SLEW CONTROL switch to OFF.

49. Repeat step B. 44.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 3

JDC
NO. 10715
REV. ____
INITIAL TDRR 19950

JOB SHAFT SERVO LOOP TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE

NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 4	DVM input voltage indication	volts	▨		▨	▨	▨
B. 6	SHAFT ANGLE CDU 16X resolver error output	mv	▨		4		
B. 8	DVM input voltage indication	volts	▨		▨	▨	▨
B. 10	SHAFT ANGLE CDU 16X resolver error output	mv	▨		4		
B. 14	DVM input voltage indication	volts	▨		▨	▨	▨
B. 18	SCT Shaft 1X resolver error output	mv	▨		40		
B. 19 (B. 8)	DVM input voltage indication	volts	▨		▨	▨	▨
B. 20	SCT Shaft 1X resolver error output	mv	▨		40		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 3

JDC
NO. 10715
REV. ____

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 23	DVM input voltage indication	volts	▨		▨	▨	▨
B. 26	Time for SXT shaft tachometer signal to reach steady-state	sec.	▨		0.5		
B. 27	Time for SCT 1X resolver error signal to reach steady-state	sec.	▨		2.5		
B. 28	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		2.5		
B. 30	DVM input voltage indication	volts	▨		▨	▨	▨
B. 31 (B.26)	Time for SXT shaft tachometer signal to reach steady-state	sec.	▨		0.5		
B. 31 (B.27)	Time for SCT shaft 1X resolver error signal to reach steady-state	sec.	▨		2.5		
B. 31 (B.28)	Time for SHAFT ANGLE CDU 16X resolver error signal to reach steady-state	sec.	▨		2.5		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 3

JDC
NO. 10715
REV. ____

JOB SHAFT SERVO LOOP TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.44.a	SCT shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.44.b	SHAFT ANGLE CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.44.c	SXT shaft tachometer maximum variation	mv (peak-to peak)	▨		8		
B.49 (B.44. a)	SCT shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49 (B.44. b)	SHAFT ANGLE CDU tachometer maximum variation	mv (peak-to-peak)	▨		8		
B.49 (B.44. c)	SXT shaft tachometer maximum variation	mv (peak-to-peak)	▨		8		

DATE ________

Released with ATP 1009502

JOB DAC SENSITIVITY TEST

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INITIAL TDRR 19950 D.S. PGS 3

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION DAC Sensitivity is tested by pulsing the DAC and monitoring encoder output pulses.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22228	All	1,2	WK	TM

REFERENCES ATP 1009502, Paragraph 3-3.17.1
JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G&N Indicator Control panel is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:
   OIA ON
   OPTICS POWER ON
   BLOCK I SERIES 100.

   NOTE: Assure that the Counter has been energized at least 15 minutes immediately prior to use in this test.
3. Set switches and selectors on G&N Indicator Control panel as follows:
   mode selector to ZERO OPTICS.
4. After CDU's have zeroed, set the OPTICS mode selector on the G&N Indicator Control panel to COMPUTER.
5. Set switches and controls on the Counter as follows to obtain a 10-second sampling time:
   FUNCTION to E/UT X N_1
   INPUT SELECTOR to A-B
   SENSE SELECTOR to FWD
   DISPLAY RESET to ZERO
   SAMPLE TIME (N_1) to 100000
   CLOCK FREQUENCY DIVIDER to 10
   CLOCK PULSE SELECTOR to INT
   DISPLAY TIME TO 10^5.

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ________

JOB DAC SENSITIVITY TEST

JDC 10716 REV A PAGE 2 OF 3

SUBSYSTEM OPTICAL

ASSY

6. Set DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to CTR.

B. PROCEDURE

1. Connect the 2X TRUNNION CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 16.
2. Apply 4 positive input pulses per burst to the Trunnion DAC by setting switches on the Apollo Computer Simulator panel as follows:
   burst control to STEADY BURST
   PULSES/BURST to 4
   POLARITY to +
   DRIVE SELECT to X OPT
3. Monitor the Counter to determine and record the 2X TRUNNION CDU encoder output pulses during the 10-second periods. Discount the first reading and record the second reading.
4. Apply 4 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch on the Apollo Computer Simulator panel to -.
5. Repeat step B.3 for the negative input pulses.
6. Apply 16 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 16.
7. Repeat step B.3 for the 16 positive input pulses per burst.
8. Apply 16 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
9. Repeat step B.3 for the 16 negative input pulses per burst.
10. Apply 64 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 64.
11. Repeat step B.3 for the 64 positive input pulses per burst.
12. Apply 64 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
13. Repeat step B.3 for the 64 negative input pulses per burst.
14. Apply 256 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 256.
15. Repeat step B.3 for the 256 positive input pulses per burst.

DATE ________

JOB DAC SENSITIVITY TEST

JDC 10716 REV A PAGE 3 OF 3

SUBSYSTEM OPTICAL

ASSY

16. Apply 256 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
17. Repeat step B.3 for the 256 negative input pulses per burst.
18. Connect the SHAFT ANGLE CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 17.
19. Apply 4 positive input pulses per burst to the Shaft DAC by setting switches on the Apollo Computer Simulator panel as follows:
    PULSES/BURST switch to 4
    POLARITY switch to +
    DRIVE SELECT switch to Y OPT
20. Monitor the Counter to determine and record the SHAFT ANGLE CDU encoder output pulses during the 10-second periods. Discount the first reading and record the second reading.
21. Apply 4 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch on the Apollo Computer Simulator panel to -.
22. Repeat step B.20 for the negative input pulses.
23. Apply 16 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 16.
24. Repeat step B.20 for the 16 positive input pulses per burst.
25. Apply 16 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
26. Repeat step B.20 for the 16 negative input pulses per burst.
27. Apply 64 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 64.
28. Repeat step B.20 for the 64 positive input pulses per burst.
29. Apply 64 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
30. Repeat step B.20 for the 64 negative input pulse per burst.
31. Apply 256 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 256.
32. Repeat step B.20 for the 256 positive input pulses per burst.
33. Apply 256 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
34. Repeat step B.20 for the 256 negative input pulses per burst.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 10716
REV. A
INITIAL TDRR 19950

JOB DAC SENSITIVITY TEST

ASSEMBLY UNDER TEST

TITLE ________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE ________
NAME ________ SER. NO. ________ CAL DATE ________

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.3	2X TRUNNION CDU encoder output pulses	pulses	48		192		
B.5 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	48		192		
B.7 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	382		710		
B.9 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	382		710		
B.11	2X TRUNNION CDU encoder output pulses	pulses	1401		2603		

DATE ________

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 **OF** 3

JDC
NO. 10716
REV. A

JOB DAC SENSITIVITY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 13 (B. 3)	2X TRUNNION CDU encoder output pulses	pulses	1401		2603		
B. 15 (B. 3)	2X TRUNNION CDU encoder output pulses	pulses	3823		7099		
B. 17 (B. 3)	2X TRUNNION CDU encoder output pulses	pulses	3823		7099		
B. 20	SHAFT ANGLE CDU encoder output pulses	pulses	65		153		
B. 22 (B. 20)	SHAFT ANGLE CDU encoder output pulses	pulses	65		153		
B. 24 (B. 20)	SHAFT ANGLE CDU encoder output pulses	pulses	351		651		
B. 26 (B. 20)	SHAFT ANGLE CDU encoder output pulses	pulses	351		651		
B. 28 (B. 20)	SHAFT ANGLE CDU encoder output pulses	pulses	1210		2248		

DATE ________

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 **OF** 3

JDC
NO. 10716
REV. A

JOB DAC SENSITIVITY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 30 (B. 20)	SHAFT ANGLE CDU encoder output pulses	pulses	1210		2248		
B. 32 (B. 20)	SHAFT ANGLE CDU encoder output pulses	pulses	3058		5680		
B. 34 (B. 20)	SHAFT ANGLE CDU encoder output pulses	pulses	3058		5680		

DATE ________

Released with ATP 1009502

JOB DAC SENSITIVITY TEST | JDC 10716 REV. B PAGE 1 OF 4
INITIAL TDRR 19950 DS PGS 3

SUBSYSTEM OPTICAL | ASSY.

DESCRIPTION DAC Sensitivity is tested by pulsing the DAC and monitoring encoder output pulses.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22228	All	1, 2	WK [illegible]	TM [illegible]
B	11-24-65	24364	3, 4	All	WK [illegible]	-

REFERENCES ATP 1009502, Paragraph 3-3.17.1
JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G&N Indicator Control panel is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:
   OIA ON
   OPTICS POWER ON
   BLOCK I SERIES 100.
   NOTE: Assure that the Counter has been energized at least 15 minutes immediately prior to use in this test.
3. Set switches and selectors on G&N Indicator Control panel as follows:
   mode selector to ZERO OPTICS.
4. After CDU's have zeroed, set the OPTICS mode selector on the G&N Indicator Control panel to COMPUTER.
5. Set switches and controls on the Counter as follows to obtain a 10-second sampling time:
   FUNCTION to E/UT X N_1
   INPUT SELECTOR to A-B
   SENSE SELECTOR to FWD
   DISPLAY RESET to ZERO
   SAMPLE TIME (N_1) to 100000
   CLOCK FREQUENCY DIVIDER to 10
   CLOCK PULSE SELECTOR to INT
   DISPLAY TIME TO 10^5.

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE 11 JUN 65

JOB DAC SENSITIVITY TEST | JDC 10716 REV B PAGE 2 OF 4

SUBSYSTEM OPTICAL | ASSY

6. Set DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to CTR.

B. PROCEDURE

1. Connect the 2X TRUNNION CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 16.
2. Apply 4 positive input pulses per burst to the Trunnion DAC by setting switches on the Apollo Computer Simulator panel as follows:
   burst control to STEADY BURST
   PULSES/BURST to 4
   POLARITY to +
   DRIVE SELECT to X OPT
3. Monitor the Counter to determine and record the 2X TRUNNION CDU encoder output pulses during the 10-second periods. Discount the first reading and record the second reading.
4. Apply 4 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch on the Apollo Computer Simulator panel to -.
5. Repeat step B.3 for the negative input pulses.
6. Apply 16 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 16.
7. Repeat step B.3 for the 16 positive input pulses per burst.
8. Apply 16 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
9. Repeat step B.3 for the 16 negative input pulses per burst.
10. Apply 64 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 64.
11. Repeat step B.3 for the 64 positive input pulses per burst.
12. Apply 64 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
13. Repeat step B.3 for the 64 negative input pulses per burst.
14. Apply 256 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 256.
15. Repeat step B.3 for the 256 positive input pulses per burst.

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JOB DAC SENSITIVITY TEST | JDC 10716 REV B PAGE 3 OF 4

SUBSYSTEM OPTICAL | ASSY

16. Apply 256 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
17. Repeat step B.3 for the 256 negative input pulses per burst.
18. Connect the SHAFT ANGLE CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 17.
19. Apply 4 positive input pulses per burst to the Shaft DAC by setting switches on the Apollo Computer Simulator panel as follows:
   PULSES/BURST switch to 4
   POLARITY switch to +
   DRIVE SELECT switch to Y OPT
20. Monitor the Counter to determine and record the SHAFT ANGLE CDU encoder output pulses during the 10-second periods. Discount the first reading and record the second reading.
21. Apply 4 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch on the Apollo Computer Simulator panel to -.
22. Repeat step B.20 for the negative input pulses.
23. Apply 16 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 16.
24. Repeat step B.20 for the 16 positive input pulses per burst.
25. Apply 16 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
26. Repeat step B.20 for the 16 negative input pulses per burst.
27. Apply 64 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 64.
28. Repeat step B.20 for the 64 positive input pulses per burst.
29. Apply 64 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
30. Repeat step B.20 for the 64 negative input pulse per burst.
31. Apply 256 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 256.
32. Repeat step B.20 for the 256 positive input pulses per burst.
33. Apply 256 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
34. Repeat step B.20 for the 256 negative input pulses per burst.
35. Using the RECORDED VALUES for the following JDC ITEM NO's perform the following calculations and record:
   a. $\frac{B.3 + B.5\ (B.3)}{2}$

DATE 11 JUN 65

JOB DAC SENSITIVITY TEST | JDC 10716 REV B PAGE 4 OF 4

SUBSYSTEM OPTICAL | ASSY

b. $\frac{B.7\ (B.3) + B.9\ (B.3)}{2}$
c. $\frac{B.11\ (B.3) + B.13\ (B.3)}{2}$
d. $\frac{B.15\ (B.3) + B.17\ (B.3)}{2}$
e. $\frac{B.20 + B.22\ (B.20)}{2}$
f. $\frac{B.24\ (B.20) + B.26\ (B.20)}{2}$
g. $\frac{B.28\ (B.20) + B.30\ (B.20)}{2}$
h. $\frac{B.32\ (B.20) + B.34\ (B.20)}{2}$

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 10716
REV. B
INITIAL TDRR 19950

JOB DAC SENSITIVITY TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.3	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.5 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.7 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.9 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.11	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 10716
REV. B

JOB DAC SENSITIVITY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.13 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.15 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.17 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.20	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.22 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.24 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.26 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.28 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 10716
REV. B

JOB DAC SENSITIVITY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.30 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.32 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.34 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.35.a	$\frac{B.3 + B.5\,(B.3)}{2}$	pulses	48		192		
B.35.b	$\frac{B.7(B.3) + B.9(B.3)}{2}$	pulses	382		710		
B.35.c	$\frac{B.11(B.3) + B.13(B.3)}{2}$	pulses	1401		2603		
B.35.d	$\frac{B.15(B.3) + B.17(B.3)}{2}$	pulses	2823		7099		
B.35.e	$\frac{B.20 + B.22(B.20)}{2}$	pulses	65		153		
B.35.f	$\frac{B.24(B.20) + B.26(B.20)}{2}$	pulses	351		651		
B.35.g	$\frac{B.28(B.20) + B.30(B.20)}{2}$	pulses	1210		2248		
B.35.h	$\frac{B.32(B.20) + B.34(B.20)}{2}$	pulses	3058		5680		

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JOB DAC SENSITIVITY TEST

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INITIAL TDRR 19950 **D.S. PGS** 3

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION DAC Sensitivity is tested by pulsing the DAC and monitoring encoder output pulses.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	9-1-65	22228	All	1, 2	WK	TM
B	11-24-65	24364	3, 4	All	WK	-
C	12 28 65	24917	-	1, 3	WK	-

REFERENCES ATP 1009502, Paragraph 3-3.17.1
JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G&N Indicator Control panel is connected to cable W87 as shown in JDC 10734.

2. Assure that the following pushbuttons on the Test Control panel are lighted:

   OIA ON
   OPTICS POWER ON
   BLOCK I SERIES 100.

   NOTE: Assure that the Counter has been energized at least 15 minutes immediately prior to use in this test.

3. Set switches and selectors on G&N Indicator Control panel as follows:

   mode selector to ZERO OPTICS.

4. After CDU's have zeroed, set the OPTICS mode selector on the G&N Indicator Control panel to COMPUTER.

5. Set switches and controls on the Counter as follows to obtain a 10-second sampling time:

   FUNCTION to E/UT X N_1
   INPUT SELECTOR to A-B
   SENSE SELECTOR to FWD
   DISPLAY RESET to ZERO
   SAMPLE TIME (N_1) to 100000
   CLOCK FREQUENCY DIVIDER to 10
   CLOCK PULSE SELECTOR to INT
   DISPLAY TIME TO 10^5.

VERIFICATION WITH SIDL REQUIRED BEFORE USE **DATE** 11 JUN 65

JOB DAC SENSITIVITY TEST

JDC 10716 **REV** C **PAGE** 2 **OF** 4

SUBSYSTEM OPTICAL

ASSY

6. Set DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to CTR.

B. PROCEDURE

1. Connect the 2X TRUNNION CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 16.
2. Apply 4 positive input pulses per burst to the Trunnion DAC by setting switches on the Apollo Computer Simulator panel as follows:

   burst control to STEADY BURST
   PULSES/BURST to 4
   POLARITY to +
   DRIVE SELECT to X OPT

3. Monitor the Counter to determine and record the 2X TRUNNION CDU encoder output pulses during the 10-second periods. Discount the first reading and record the second reading.
4. Apply 4 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch on the Apollo Computer Simulator panel to -.
5. Repeat step B.3 for the negative input pulses.
6. Apply 16 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 16.
7. Repeat step B.3 for the 16 positive input pulses per burst.
8. Apply 16 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
9. Repeat step B.3 for the 16 negative input pulses per burst.
10. Apply 64 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 64.
11. Repeat step B.3 for the 64 positive input pulses per burst.
12. Apply 64 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
13. Repeat step B.3 for the 64 negative input pulses per burst.
14. Apply 256 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 256.
15. Repeat step B.3 for the 256 positive input pulses per burst.

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JOB DAC SENSITIVITY TEST

JDC 10716 **REV** C **PAGE** 3 **OF** 4

SUBSYSTEM OPTICAL

ASSY

16. Apply 256 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
17. Repeat step B.3 for the 256 negative input pulses per burst.
18. Connect the SHAFT ANGLE CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 17.
19. Apply 4 positive input pulses per burst to the Shaft DAC by setting switches on the Apollo Computer Simulator panel as follows:

   PULSES/BURST switch to 4
   POLARITY switch to +
   DRIVE SELECT switch to Y OPT

20. Monitor the Counter to determine and record the SHAFT ANGLE CDU encoder output pulses during the 10-second periods. Discount the first reading and record the second reading.
21. Apply 4 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch on the Apollo Computer Simulator panel to -.
22. Repeat step B.20 for the negative input pulses.
23. Apply 16 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 16.
24. Repeat step B.20 for the 16 positive input pulses per burst.
25. Apply 16 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
26. Repeat step B.20 for the 16 negative input pulses per burst.
27. Apply 64 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 64.
28. Repeat step B.20 for the 64 positive input pulses per burst.
29. Apply 64 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
30. Repeat step B.20 for the 64 negative input pulse per burst.
31. Apply 256 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 256.
32. Repeat step B.20 for the 256 positive input pulses per burst.
33. Apply 256 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
34. Repeat step B.20 for the 256 negative input pulses per burst.
35. Using the RECORDED VALUES for the following JDC ITEM NO's perform the following calculations and record:

   a. $\frac{B.3 + B.5\ (B.3)}{2}$

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JOB DAC SENSITIVITY TEST

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SUBSYSTEM OPTICAL

ASSY

   b. $\frac{B.7\ (B.3) + B.9\ (B.3)}{2}$

   c. $\frac{B.11\ (B.3) + B.13\ (B.3)}{2}$

   d. $\frac{B.15\ (B.3) + B.17\ (B.3)}{2}$

   e. $\frac{B.20 + B.22\ (B.20)}{2}$

   f. $\frac{B.24\ (B.20) + B.26\ (B.20)}{2}$

   g. $\frac{B.28\ (B.20) + B.30\ (B.20)}{2}$

   h. $\frac{B.32\ (B.20) + B.34\ (B.20)}{2}$

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 10716
REV. C
INITIAL TDRR 19950

JOB DAC SENSITIVITY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.3	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.5 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.7 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.9 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.11 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 10716
REV. C

JOB DAC SENSITIVITY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.13 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.15 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.17 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	▨		▨	▨	▨
B.20	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.22 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.24 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.26 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.28 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 10716
REV. C

JOB DAC SENSITIVITY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.30 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.32 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.34 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	▨		▨	▨	▨
B.35.a	$\frac{B.3 + B.5 (B.3)}{2}$	pulses	48		192		
B.35.b	$\frac{B.7(B.3) + B.9(B.3)}{2}$	pulses	382		710		
B.35.c	$\frac{B.11(B.3) + B.13(B.3)}{2}$	pulses	1401		2603		
B.35.d	$\frac{B.15(B.3) + B.17(B.3)}{2}$	pulses	3823		7099		
B.35.e	$\frac{B.20 + B.22(B.20)}{2}$	pulses	65		153		
B.35.f	$\frac{B.24(B.20) + B.26(B.20)}{2}$	pulses	351		651		
B.35.g	$\frac{B.28(B.20) + B.30(B.20)}{2}$	pulses	1210		2248		
B.35.h	$\frac{B.32(B.20) + B.34(B.20)}{2}$	pulses	3058		5680		

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JOB DAC SENSITIVITY TEST

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INITIAL TDRR 19950 D.S. PGS 3

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION DAC Sensitivity is tested by pulsing the DAC and monitoring encoder output pulses.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ATP 1009502, Paragraph 3-3.17.1 JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G&N Indicator Control panel is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:
   - OIA ON/ISS POWER DISABLED
   - OPTICS POWER ON
   - BLOCK I SERIES 100.

   NOTE: Assure that the Counter has been energized at least 15 minutes immediately prior to use in this test.
3. Set switches and selectors on G&N Indicator Control panel as follows:
   mode selector to ZERO OPTICS.
4. After CDU's have zeroed, set the OPTICS mode selector on the G&N Indicator Control panel to COMPUTER.
5. Set switches and controls on the Counter as follows to obtain a 10-second sampling time:
   - FUNCTION to E/UT X N_1
   - INPUT SELECTOR to A-B
   - SENSE SELECTOR to FWD
   - DISPLAY RESET to ZERO
   - SAMPLE TIME (N_1) to 100000
   - CLOCK FREQUENCY DIVIDER to 10
   - CLOCK PULSE SELECTOR to INT
   - DISPLAY TIME TO 10^5.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB DAC SENSITIVITY TEST

JDC 10716 REV PAGE 2 OF 3

SUBSYSTEM OPTICAL

ASSY

6. Set DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to CTR.

B. PROCEDURE

1. Connect the 2X TRUNNION CDU +Δθ and -Δθ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 16.
2. Apply one positive input pulse per burst to the Trunnion DAC by setting switches on the Apollo Computer Simulator panel as follows:
   - burst control to STEADY BURST
   - PULSES/BURST to 1
   - POLARITY to +
   - DRIVE SELECT to X OPT
3. Monitor the Counter to determine and record the 2X TRUNNION CDU encoder output pulses during the 10-second periods. Discount the first reading and record the second reading.
4. Apply one negative input pulse per burst to the Trunnion DAC by setting the POLARITY switch on the Apollo Computer Simulator panel to -.
5. Repeat step B.3 for the negative input pulses.
6. Apply 16 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 16.
7. Repeat step B.3 for the 16 positive input pulses per burst.
8. Apply 16 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
9. Repeat step B.3 for the 16 negative input pulses per burst.
10. Apply 64 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 64.
11. Repeat step B.3 for the 64 positive input pulses per burst.
12. Apply 64 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
13. Repeat step B.3 for the 64 negative input pulses per burst.
14. Apply 256 positive input pulses per burst to the Trunnion DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 256.
15. Repeat step B.3 for the 256 positive input pulses per burst.

DATE ________

JOB DAC SENSITIVITY TEST

JDC 10716 REV PAGE 3 OF 3

SUBSYSTEM OPTICAL

ASSY

16. Apply 256 negative input pulses per burst to the Trunnion DAC by setting the POLARITY switch to -.
17. Repeat step B.3 for the 256 negative input pulses per burst.
18. Connect the SHAFT ANGLE CDU +Δθ and -Δθ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 17.
19. Apply one positive input pulse per burst to the Shaft DAC by setting switches on the Apollo Computer Simulator panel as follows:
   - PULSES/BURST switch to 1
   - POLARITY switch to +
   - DRIVE SELECT switch to Y OPT
20. Monitor the Counter to determine and record the SHAFT ANGLE CDU encoder output pulses during the 10-second periods. Discount the first reading and record the second reading.
21. Apply one negative input pulse per burst to the Shaft DAC by setting the POLARITY switch on the Apollo Computer Simulator panel to -.
22. Repeat step B.20 for the negative input pulses.
23. Apply 16 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 16.
24. Repeat step B.20 for the 16 positive input pulses per burst.
25. Apply 16 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
26. Repeat step B.20 for the 16 negative input pulses per burst.
27. Apply 64 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 64.
28. Repeat step B.20 for the 64 positive input pulses per burst.
29. Apply 64 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
30. Repeat step B.20 for the 64 negative input pulse per burst.
31. Apply 256 positive input pulses per burst to the Shaft DAC by setting the POLARITY switch to + and the PULSES/BURST switch to 256.
32. Repeat step B.20 for the 256 positive input pulses per burst.
33. Apply 256 negative input pulses per burst to the Shaft DAC by setting the POLARITY switch to -.
34. Repeat step B.20 for the 256 negative input pulses per burst.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 10716 JDC
REV. ____
INITIAL TDRR 19950

JOB DAC SENSITIVITY TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE

NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION

APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.3	2X TRUNNION CDU encoder output pulses	pulses	20		38		
B.5 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	20		38		
B.7 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	382		710		
B.9 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	382		710		
B.11	2X TRUNNION CDU encoder output pulses	pulses	1401		2603		

DATE ________

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 **OF** 3

JDC
NO. 10716
REV. ____

JOB DAC SENSITIVITY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.13 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	1401		2603		
B.15 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	3823		7099		
B.17 (B.3)	2X TRUNNION CDU encoder output pulses	pulses	3823		7099		
B.20	SHAFT ANGLE CDU encoder output pulses	pulses	17		33		
B.22 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	17		33		
B.24 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	351		651		
B.26 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	351		651		
B.28 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	1210		2248		

DATE ________

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 **OF** 3

JDC
NO. 10716
REV. ____

JOB DAC SENSITIVITY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.30 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	1210		2248		
B.32 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	3058		5680		
B.34 (B.20)	SHAFT ANGLE CDU encoder output pulses	pulses	3058		5680		

DATE ________

Released with ATP 1009502

JDC 10717 REV. A PAGE 1 OF 2
INITIAL TDRR 19950 D.S. PGS 1

JOB DAC DRIFT TEST

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION CDU drift rates in COMPUTER mode are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-65	22229	1	-	WK	TM

REFERENCES ATP 1009502
Paragraph 3-3.17.2
JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G & N Indicator Control panel is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:
   OIA ON
   OPTICS POWER ON
   BLOCK I SERIES 100.

   NOTE: Assure that the Counter has been energized at least 15 minutes immediately prior to use in this test.
3. Set switches and selectors on G & N Indicator Control panel as follows:
   mode selector to ZERO OPTICS.
4. After CDU's have zeroed, set the Optics mode selector on G & N Indicator Control panel to COMPUTER.
5. Set the Counter to count for 19.7754 seconds by setting switches and controls as follows:
   FUNCTION to E/UT X N_1
   SAMPLE TIME (N_1) to 197754
   INPUT SELECTOR to A-B
   CLOCK FREQUENCY DIVIDER to 10
   SENSE SELECTOR to FWD
   DISPLAY RESET to ZERO
   DISPLAY TIME (N_2) to 10^5.
6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to CTR.

B. PROCEDURE

1. Connect the 2X TRUNNION CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 16.
2. Press RESET pushbutton on Counter.

   NOTE: The Counter readout is equal to the CDU drift rate in $\widehat{sec}$/sec as shown by the following equation:

$$\text{CDU drift rate} = \frac{\text{pulses} \times 19.7754\ \widehat{sec}/\text{pulse}}{19.7754\ \text{sec}}$$

3. Monitor the Counter to determine and record the CDU drift rate.
4. Connect the SHAFT ANGLE CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 17.
5. Set the counter to count for 39.5508 seconds by setting SAMPLE TIME (N1) to 395508.
6. Repeat steps B.2 and B.3 for the SHAFT ANGLE CDU.

   NOTE: The Counter readout is equal to the CDU drift rate in $\widehat{sec}$/sec as shown by the following equation:

$$\text{CDU drift rate} = \frac{\text{pulses} \times 39.5508\ \widehat{sec}/\text{pulse}}{39.5508\ \text{sec}}$$

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ______

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 10717
REV. A
INITIAL TDRR 19950

JOB DAC DRIFT TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END SITE / LOCATION
TIME ______ START ______ END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.3	2X TRUNNION CDU DAC drift rate	$\widehat{sec}$/sec	▨		144		
B.6 (B.3)	SHAFT ANGLE CDU DAC drift rate	$\widehat{sec}$/sec	▨		144		

DATE ______

Released with ATP 1009502

JOB DAC DRIFT TEST

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INITIAL TDRR 19950 **D.S. PGS** 1

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION CDU drift rates in COMPUTER mode are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
M A	9-1-65	22229	1	-	WK [illegible]	TM [illegible]
B	11-24-65	24363	-	1	WK [illegible]	-

REFERENCES ATP 1009502
Paragraph 3-3.17.2
JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G & N Indicator Control panel is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:
    OIA ON
    OPTICS POWER ON
    BLOCK I SERIES 100.

    NOTE: Assure that the Counter has been energized at least 15 minutes immediately prior to use in this test.
3. Set switches and selectors on G & N Indicator Control panel as follows:
    mode selector to ZERO OPTICS.
4. After CDU's have zeroed, set the Optics mode selector on G & N Indicator Control panel to COMPUTER.
5. Set the Counter to count for 19.7754 seconds by setting switches and controls as follows:
    FUNCTION to E/UT X N_1
    SAMPLE TIME (N_1) to 197754
    INPUT SELECTOR to A-B
    CLOCK FREQUENCY DIVIDER to 10
    SENSE SELECTOR to FWD
    DISPLAY RESET to ZERO
    DISPLAY TIME (N_2) to 10^5.
6. Set the DIGITAL RECORDER SELECTOR

VERIFICATION WITH SIDL REQUIRED BEFORE USE **DATE** 11 JUN 65

JOB DAC DRIFT TEST

JDC 10717 **REV** B **PAGE** 2 **OF** 2

SUBSYSTEM OPTICAL

ASSY

switch on the Primary Signal Selector panel to CTR.

B. PROCEDURE

1. Connect the 2X TRUNNION CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 16.
2. Press RESET pushbutton on Counter.

    NOTE: The Counter readout is equal to the CDU drift rate in $\widehat{\text{sec}}$/sec as shown by the following equation:

$$\text{CDU drift rate} = \frac{\text{pulses x } 19.7754\ \widehat{\text{sec}}/\text{pulse}}{19.7754 \text{ sec}}$$

3. Monitor the Counter to determine and record the CDU drift rate.
4. Connect the SHAFT ANGLE CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 17.
5. Set the counter to count for 39.5508 seconds by setting SAMPLE TIME (N1) to 395508.
6. Repeat steps B.2 and B.3 for the SHAFT ANGLE CDU.

    NOTE: The Counter readout is equal to the CDU drift rate in $\widehat{\text{sec}}$/sec as shown by the following equation:

$$\text{CDU drift rate} = \frac{\text{pulses x } 39.5508\ \widehat{\text{sec}}/\text{pulse}}{39.5508 \text{ sec}}$$

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

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REV. A
INITIAL TDRR 19950

JOB DAC DRIFT TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ **DWG** ______ **REV.** ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ **SER. NO.** ______ CAL DATE

NAME ______ **SER. NO.** ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION **APPROVED BY** ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.3	2X TRUNNION CDU DAC drift rate	$\frac{\widehat{\text{sec}}}{\text{sec}}$	▨		230		
B.6 (B.3)	SHAFT ANGLE CDU DAC drift rate	$\frac{\widehat{\text{sec}}}{\text{sec}}$	▨		380		

DATE 11 JUN 65

Released with ATP 1009502

JDC 10717 REV. C PAGE 1 OF 2

JOB DAC DRIFT TEST

INITIAL TDRR 19950 D.S PGS 1

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION CDU drift rates in COMPUTER mode are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	9-1-65	22229	1	-	WK	TM
B	11-24-65	24363	-	1	WK	-
C	12 28 65	24919	-	1	WK	-

REFERENCES ATP 1009502
Paragraph 3-3.17.2
JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G & N Indicator Control panel is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:
   - OIA ON
   - OPTICS POWER ON
   - BLOCK I SERIES 100.

   NOTE: Assure that the Counter has been energized at least 15 minutes immediately prior to use in this test.
3. Set switches and selectors on G & N Indicator Control panel as follows:

   mode selector to ZERO OPTICS.
4. After CDU's have zeroed, set the Optics mode selector on G & N Indicator Control panel to COMPUTER.
5. Set the Counter to count for 19.7754 seconds by setting switches and controls as follows:
   - FUNCTION to E/UT X N_1
   - SAMPLE TIME (N_1) to 197754
   - INPUT SELECTOR to A-B
   - CLOCK FREQUENCY DIVIDER to 10
   - SENSE SELECTOR to FWD
   - DISPLAY RESET to ZERO
   - DISPLAY TIME (N_2) to 10^5.
6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to CTR.

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE 11 JUN 65

JOB DAC DRIFT TEST

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SUBSYSTEM OPTICAL

ASSY

B. PROCEDURE

1. Connect the 2X TRUNNION CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 16.
2. Press RESET pushbutton on Counter.

   NOTE: The Counter readout is equal to the CDU drift rate in $\widehat{sec}$/sec as shown by the following equation:

$$\text{CDU drift rate} = \frac{\text{pulses x } 19.7754\ \widehat{\text{sec}}/\text{pulse}}{19.7754\ \text{sec}}$$

3. Monitor the Counter to determine and record the CDU drift rate.
4. Connect the SHAFT ANGLE CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 17.
5. Set the counter to count for 39.5508 seconds by setting SAMPLE TIME (N1) to 395508.
6. Repeat steps B.2 and B.3 for the SHAFT ANGLE CDU.

NOTE: The Counter readout is equal to the CDU drift rate in $\widehat{sec}$/sec as shown by the following equation:

$$\text{CDU drift rate} = \frac{\text{pulses x } 39.5508\ \widehat{\text{sec}}/\text{pulse}}{39.5508\ \text{sec}}$$

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 10717 JDC
REV. C
INITIAL TDRR 19950

JOB DAC DRIFT TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.3	2X TRUNNION CDU DAC drift rate	$\widehat{sec}$/sec	▨		230		
B.6 (B.3)	SHAFT ANGLE CDU DAC drift rate	$\widehat{sec}$/sec	▨		380		

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Released with ATP 1009502

JOB DAC DRIFT TEST

JDC 10717 REV. ____ PAGE 1 OF 2

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SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION CDU drift rates in COMPUTER mode are tested.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ATP 1009502
Paragraph 3-3.17.2
JDC 10734

IMPORTANT JDC 10702 shall have been performed.

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Assure that the G & N Indicator Control panel is connected to cable W87 as shown in JDC 10734.
2. Assure that the following pushbuttons on the Test Control panel are lighted:
   OIA ON/ISS POWER DISABLED
   OPTICS POWER ON
   BLOCK I SERIES 100.

   NOTE: Assure that the Counter has been energized at least 15 minutes immediately prior to use in this test.
3. Set switches and selectors on G & N Indicator Control panel as follows:
   mode selector to ZERO OPTICS.
4. After CDU's have zeroed, set the Optics mode selector on G & N Indicator Control panel to COMPUTER.
5. Set the Counter to count for 19.7754 seconds by setting switches and controls as follows:
   FUNCTION to E/UT X N_1
   SAMPLE TIME (N_1) to 197754
   INPUT SELECTOR to A-B
   CLOCK FREQUENCY DIVIDER to 10
   SENSE SELECTOR to FWD
   DISPLAY RESET to ZERO
   DISPLAY TIME (N_2) to 10^5.
6. Set the DIGITAL RECORDER SELECTOR switch on the Primary Signal Selector panel to CTR.

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ____

JOB DAC DRIFT TEST

JDC 10717 REV PAGE 2 OF 2

SUBSYSTEM OPTICAL

ASSY

B. PROCEDURE

1. Connect the 2X TRUNNION CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 16.
2. Press RESET pushbutton on Counter.

   NOTE: The Counter readout is equal to the CDU drift rate in $\widehat{\text{sec}}$/sec as shown by the following equation:

$$\text{CDU drift rate} = \frac{\text{pulses x } 19.7754\ \widehat{\text{sec}}/\text{pulse}}{19.7754\ \text{sec}}$$

3. Monitor the Counter to determine and record the CDU drift rate.
4. Connect the SHAFT ANGLE CDU $+\Delta\theta$ and $-\Delta\theta$ signals to the Counter by setting the COUNTER INPUT "A" OR "AB" switch on the Primary Signal Selector panel to 17.
5. Set the counter to count for 39.5508 seconds by setting SAMPLE TIME (N1) to 395508.
6. Repeat steps B.2 and B.3 for the SHAFT ANGLE CDU.

   NOTE: The Counter readout is equal to the CDU drift rate in $\widehat{\text{sec}}$/sec as shown by the following equation:

$$\text{CDU drift rate} = \frac{\text{pulses x } 39.5508\ \widehat{\text{sec}}/\text{pulse}}{39.5508\ \text{sec}}$$

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 10717
REV. ____
INITIAL TDRR ____

JOB DAC DRIFT TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.3	2X TRUNNION CDU DAC drift rate	$\frac{\widehat{\text{sec}}}{\text{sec}}$	▨		144		
B.6 (B.3)	SHAFT ANGLE CDU DAC drift rate	$\frac{\widehat{\text{sec}}}{\text{sec}}$	▨		144		

DATE ____

Released with ATP 1009502

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE

JDC 10733 **REV.** A **PAGE** 1 **OF** 5

INITIAL TDRR 19950 **D.S. PGS** 1

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Procedure for installation and leveling of the Shaft Accuracy Tester Rotary Table on the Shaft Accuracy Tester Base Assembly.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	10-19-65	23227	All	All	MW	-

REFERENCES ATP 1015100 Para. 3-2.3
ATP 1010191 Para. 3-2.3
ATP 1009502 Para. 3-2.3

IMPORTANT JDC 10732 and JDC 10102 or 10602 or 10702 shall have been performed

INTERVAL

TOOLS AND MATERIAL

NOTE: To lift the Shaft Accuracy Tester (SAT) Rotary Table and Mirror Assembly, attach the hoist to the three eyebolts on the jig plate assembly. Assure that the hoist chains do not strain against the SAT Rotary Table.

1. Install the SAT Rotary Table and Mirror Assembly on the SAT Base Assembly by mounting the three leveling pad retainers to the SAT Base Assembly with the 12 screws and lockwashers provided.

2. Adjust the height of the Turntable Base to 17 7/8 (±1/8) inches below the surface of the Rotary Table as shown in figure 1, using the threaded studs on the jig plate assembly.

3. Connect the transducer of the Electronic Level (Talyvel) to the meter. Set the meter selector switch to the "8" (minutes scale) position.

4. Depress the BATTERY VOLTS button inside the access door at the rear of the Talyvel meter. The meter dial shall deflect past the red battery test mark. If not, replace the batteries.

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE 11 JUN 65

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE

JDC 10733 **REV** A **PAGE** 2 **OF** 5

SUBSYSTEM OPTICAL

ASSY

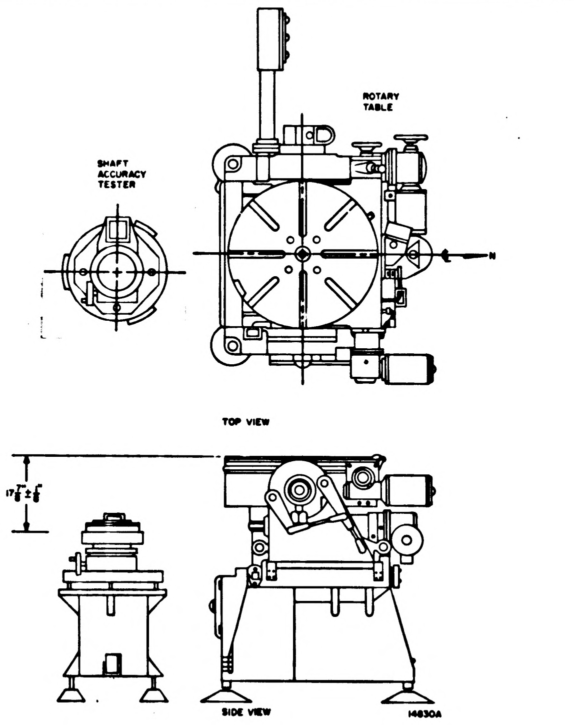

Figure 1. Shaft Accuracy Tester and Rotary Table

DATE 11 JUN 65

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE

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SUBSYSTEM OPTICAL

ASSY

NOTE: Select one of the three jig plate assembly leveling pads as a reference pad and consider as pad No. 1. Consider the remaining two leveling pads as pads No. 2 and 3 numbered in a counterclockwise sequence as shown in figure 2. Consider the Talyvel transducer micrometer adjust knob nearest to the Talyvel meter interconnect cord as the left knob. Consider deflection of the Talyvel meter dial to the right of the zero position as positive.

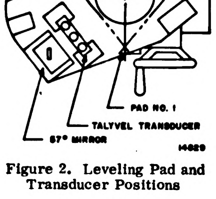

Figure 2. Leveling Pad and Transducer Positions

5. Position the SAT Rotary Table such that the surface of the 57° mirror is approximately parallel to a line between leveling pads No. 1 and 3. Note the SAT Rotary Table setting.

6. Place the Talyvel transducer on the two machined surfaces on the Turntable Base directly in front of the 57° mirror (see figure 2) with the transducer axis parallel to a line between leveling pads No. 1 and 3 oriented with the left micrometer knob nearest to pad No. 1.

7. Set both micrometer adjust knobs on the transducer to zero by aligning the zero indications on the drums to the centers of the top horizontal scribe marks on the shafts.

NOTE: Clockwise adjustment of the right micrometer knob on the transducer will cause positive deflection of the meter pointer; clockwise adjustment of the left knob will cause negative deflection of the meter pointer.

8. Set the Talyvel meter to zero by clockwise adjustment of the right or left micrometer knob, as required. Note the indications of both micrometers.

DATE 11 JUN 65

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE

JDC 10733 **REV** A **PAGE** 4 **OF** 5

SUBSYSTEM OPTICAL

ASSY

NOTE: To determine Talyvel meter indications in steps 9 and 11 when the pointer is off-scale in the 8 arc minute range, adjust the required micrometer knob in the clockwise direction until the meter indication is zero. The meter indication in micrometer units is the difference between initial and final indications of the adjusted micrometer (positive if the pointer was off-scale to the right, negative if off-scale to the left).

9. Drive the SAT Rotary Table through 120 degrees in the increasing direction. Monitor and note the Talyvel meter indication as R_1, using the most sensitive scale possible.

10. If one of the micrometer adjustment knobs was adjusted in step 9, reset the micrometer to the value noted in step 8.

11. Drive the SAT Rotary Table through 120 degrees in the increasing direction. Monitor and note the Talyvel meter indication as R_2, using the most sensitive scale possible.

NOTE: If one of the measured meter indications (R_1 or R_2) is in micrometer units and the second is in arc minutes or arc seconds, treat the second indication as zero in step 12.

12. Calculate and note leveling pad corrections as follows:

$$\beta_3 = \frac{R_1 + R_2}{3}$$

$$\beta_2 = \frac{R_2 - 2R_1}{3}$$

If both β_2 and β_3 are equal to or less than 5 arc seconds, proceed to step 22.

13. Set both micrometer indications to zero.

14. Adjust the right or left micrometer knob, as required, to set the meter indication to zero. Note both micrometer indications.

15. Adjust the right or left micrometer knob, as required, to set the meter indication to β_3. If β_3 is in micrometer units, adjust the required micrometer knob through β_3 micrometer units.

NOTE: Raise leveling pad No. 3 in step 16 if β_3 is negative.

16. Adjust leveling pad No. 3 until the meter indication is zero.

17. Repeat steps 13 and 14.

18. Adjust the right or left micrometer knob, as required, to set the meter indication to β_2. If β_2 is in micrometer units, adjust the required micrometer knob through β_2 micrometer units.

DATE 11 JUN 65

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE | JDC 10733 REV A PAGE 5 OF 5

SUBSYSTEM OPTICAL | ASSY

NOTE: Raise leveling pad No. 2 in step 19 if β_2 is positive.

19. Adjust leveling pad No. 2 until the meter indication is zero.
20. Drive the SAT Rotary Table through 120 degrees in the increasing direction to the position noted in step 5.
21. Repeat steps 7 through 21.
22. Record R_1, R_2, β_2 and β_3.
23. Set the Talyvel meter selector switch to OFF, tighten the two micrometer adjustment knobs fully clockwise, and store the Talyvel.

DATE 11 JUN 65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 10733 JDC
REV. A
INITIAL TDRR 19950

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
22	Meter indication R_1	$\widehat{\text{sec}}$	▨	( ) ______	▨	▨	▨
	Meter indication R_2	$\widehat{\text{sec}}$	▨	( ) ______	▨	▨	▨
	Pad No. 3 correction β_3	$\widehat{\text{sec}}$	▨	( ) ______	5	▨	▨
	Pad No. 2 correction β_2	$\widehat{\text{sec}}$	▨	( ) ______	5	▨	▨

DATE 11 JUN 65

Released with ATP 1009502

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE

JDC 10733 **REV.** – **PAGE** 1 **OF** 5

INITIAL TDRR 19950 **D.S. PGS** 1

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Procedure for installation and leveling of the Shaft Accuracy Tester Rotary Table on the Shaft Accuracy Tester Base Assembly.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	
							REFERENCES ATP 1015100 Para. 3-2.3 ATP 1010191 Para. 3-2.3 ATP 1009502 Para. 3-2.3
							IMPORTANT JDC 10732 and JDC 10102 or 10602 or 10702 shall have been performed
							INTERVAL
							TOOLS AND MATERIAL

NOTE: To lift the Shaft Accuracy Tester (SAT) Rotary Table and Mirror Assembly, attach the hoist to the three eyebolts on the jig plate assembly. Assure that the hoist chains do not strain against the SAT Rotary Table.

1. Install the SAT Rotary Table and Mirror Assembly on the SAT Base Assembly by mounting the three leveling pad retainers to the SAT Base Assembly with the 12 screws and lockwashers provided.

2. Adjust the height of the Turntable Base to 17 7/8 (±1/8) inches below the surface of the Rotary Table as shown in figure 1, using the threaded studs on the jig plate assembly.

3. Connect the transducer of the Electronic Level (Talyvel) to the meter. Set the meter selector switch to the "8" (minutes scale) position.

4. Depress the BATTERY VOLTS button inside the access door at the rear of the Talyvel meter. The meter dial shall deflect past the red battery test mark. If not, replace the batteries.

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ______

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE

JDC 10733 **REV** – **PAGE** 2 **OF** 5

SUBSYSTEM OPTICAL

ASSY

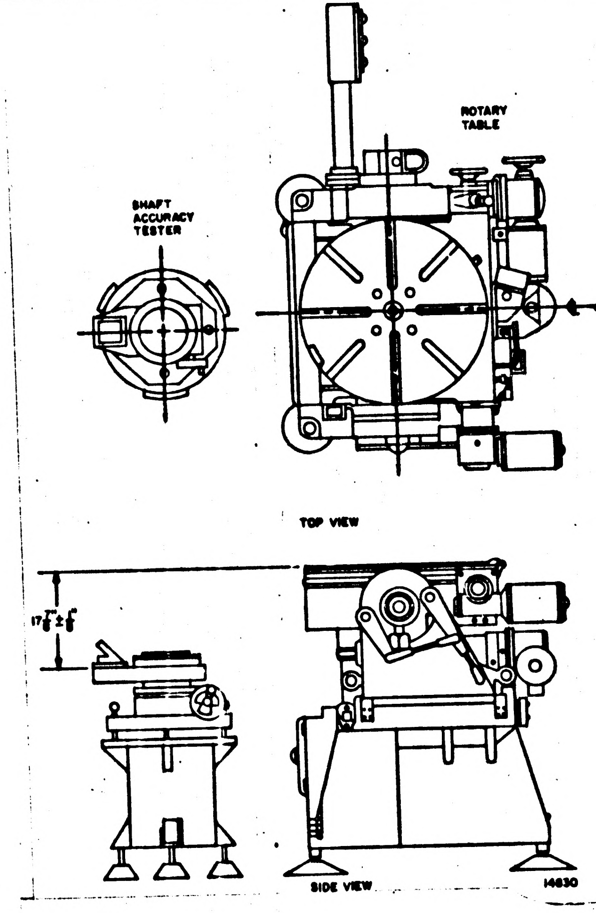

Figure 1. Shaft Accuracy Tester and Rotary Table

DATE ______

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE

JDC 10733 **REV** – **PAGE** 3 **OF** 5

SUBSYSTEM OPTICAL

ASSY

NOTE: Select one of the three jig plate assembly leveling pads as a reference pad and consider as pad No. 1. Consider the remaining two leveling pads as pads No. 2 and 3 numbered in a counterclockwise sequence as shown in figure 2. Consider the Talyvel transducer micrometer adjust knob nearest to the Talyvel meter interconnect cord as the left knob. Consider deflection of the Talyvel meter dial to the right of the zero position as positive.

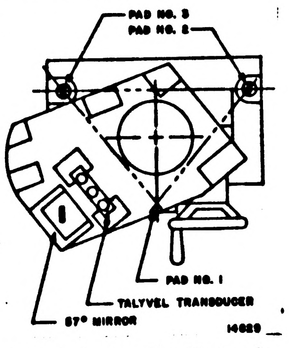

Figure 2. Leveling Pad and Transducer Positions

5. Position the SAT Rotary Table such that the surface of the 57° mirror is approximately parallel to a line between leveling pads No. 1 and 3. Note the SAT Rotary Table setting.

6. Place the Talyvel transducer on the two machined surfaces on the Turntable Base directly in front of the 57° mirror (see figure 2) with the transducer axis parallel to a line between leveling pads No. 1 and 3 oriented with the left micrometer knob nearest to pad No. 1.

7. Set both micrometer adjust knobs on the transducer to zero by aligning the zero indications on the drums to the centers of the top horizontal scribe marks on the shafts.

NOTE: Clockwise adjustment of the right micrometer knob on the transducer will cause positive deflection of the meter pointer; clockwise adjustment of the left knob will cause negative deflection of the meter pointer.

8. Set the Talyvel meter to zero by clockwise adjustment of the right or left micrometer knob, as required. Note the indications of both micrometers.

DATE ______

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE

JDC 10733 **REV** – **PAGE** 4 **OF** 5

SUBSYSTEM OPTICAL

ASSY

NOTE: To determine Talyvel meter indications in steps 9 and 11 when the pointer is off-scale in the 8 arc minute range, adjust the required micrometer knob in the clockwise direction until the meter indication is zero. The meter indication in micrometer units is the difference between initial and final indications of the adjusted micrometer (positive if the pointer was off-scale to the right, negative if off-scale to the left).

9. Drive the SAT Rotary Table through 120 degrees in the increasing direction. Monitor and note the Talyvel meter indication as R_1, using the most sensitive scale possible.

10. If one of the micrometer adjustment knobs was adjusted in step 9, reset the micrometer to the value noted in step 8.

11. Drive the SAT Rotary Table through 120 degrees in the increasing direction. Monitor and note the Talyvel meter indication as R_2, using the most sensitive scale possible.

NOTE: If one of the measured meter indications (R_1 or R_2) is in micrometer units and the second is in arc minutes or arc seconds, treat the second indication as zero in step 12.

12. Calculate and note leveling pad corrections as follows:

$$\beta_3 = \frac{R_1 + R_2}{3}$$

$$\beta_2 = \frac{R_2 - 2R_1}{3}$$

If both β_2 and β_3 are equal to or less than 5 arc seconds, proceed to step 22.

13. Set both micrometer indications to zero.

14. Adjust the right or left micrometer knob, as required, to set the meter indication to zero. Note both micrometer indications.

15. Adjust the right or left micrometer knob, as required, to set the meter indication to β_3. If β_3 is in micrometer units, adjust the required micrometer knob through β_3 micrometer units.

NOTE: Raise leveling pad No. 3 in step 16 if β_3 is negative.

16. Adjust leveling pad No. 3 until the meter indication is zero.

17. Repeat steps 13 and 14.

18. Adjust the right or left micrometer knob, as required, to set the meter indication to β_2. If β_2 is in micrometer units, adjust the required micrometer knob through β_2 micrometer units.

DATE ______

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE | JDC 10733 REV - PAGE 5 OF 5

SUBSYSTEM OPTICAL | ASSY

NOTE: Raise leveling pad No. 2 in step 19 if β_2 is positive.

19. Adjust leveling pad No. 2 until the meter indication is zero.
20. Drive the SAT Rotary Table through 120 degrees in the increasing direction to the position noted in step 5.
21. Repeat steps 7 through 21.
22. Record R_1, R_2, β_2 and β_3.
23. Set the Talyvel meter selector switch to OFF, tighten the two micrometer adjustment knobs fully clockwise, and store the Talyvel.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 10733 JDC
REV. -
INITIAL TDRR 19950

JOB INSTALLATION OF SHAFT ACCURACY TESTER ROTARY TABLE

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
22	Meter indication R_1	$\widehat{sec}$	▨	( ) ______	▨	▨	▨
	Meter indication R_2	$\widehat{sec}$	▨	( ) ______	▨	▨	▨
	Pad No. 3 correction β_3	$\widehat{sec}$	▨	( ) ______	5	▨	▨
	Pad No. 2 correction β_2	$\widehat{sec}$	▨	( ) ______	5	▨	▨

DATE ______

Released with ATP 1009502

JOB CALIBRATION OF ALIGNMENT MIRROR ASSEMBLY

JDC 10739 **REV.** A **PAGE** 1 **OF** 6

INITIAL TDRR 19950 **D.S. PGS** 2

SUBSYSTEM OPTICAL

ASSY.

DESCRIPTION Zero reference positions of the Alignment Mirror Assembly autocollimator dial are obtained for use in the Optics-Nav. Base alignment checks.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-16-65	22527	All	All	MGM	TM

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Mercury pool

A. PREPARATION

1. Assure that the Alignment Certification Fixture is resting on a suitably stable surface.
2. Inspect the Alignment Certification Fixture mounting pads and azimuth alignment pins to insure that they are not damaged and are free of dirt. Carefully wipe pads and pins with lint free lens paper or a camel's hair brush.
3. Connect the transducer of the Electronic Level (Talyvel) to the meter. Set the meter selector switch to the "8" (minutes scale) position and depress the BATTERY VOLTS button inside the rear access door of the Talyvel meter. The meter dial shall deflect past the red battery test mark. If not, replace the batteries.
4. Place the transducer on the machined pads between the two azimuth alignment pins on the Alignment Certification Fixture (Talyvel position No. 1 shown in figure 1).
5. Set both micrometer adjust knobs on the transducer to zero by aligning the zero indications on the drums to the centers of the top horizontal scribe marks on the shafts.
6. Adjust one of the two micrometer adjustment knobs on the transducer, as required, in the clockwise direction to set the meter indication to zero. Note both micrometer settings.
7. Rotate the transducer 180 degrees.

NOTE: If the meter pointer is off-scale on the 8 arc

VERIFICATION WITH SIDL REQUIRED BEFORE USE **DATE** ______

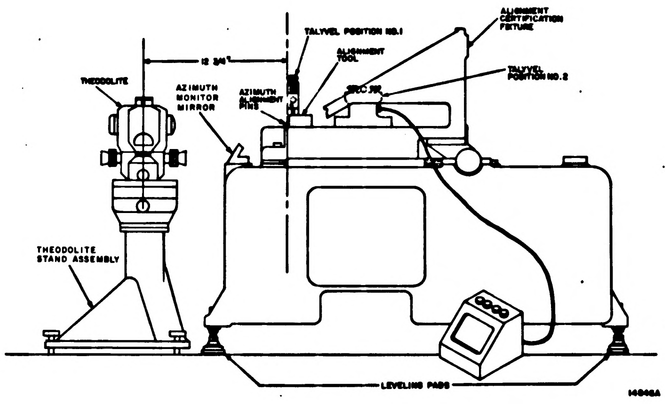

Figure 1. Alignment Equipment Location

DATE ______

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minute scale in steps A.8 or A.13, adjust the required micrometer knob in the clockwise direction until the meter indication is zero. Note the difference between the initial and final indications of the adjusted micrometer.

8. Monitor and note the meter indication using the most sensitive scale possible. If the meter indication is within ±2 arc seconds of zero, proceed to step A.11; if not, adjust one of the two micrometer knobs, as required, to set the meter indication to one-half of the value noted.
9. Adjust one of the two front leveling pads on the Alignment Certification Fixture to set the meter indication to zero.
10. Rotate the transducer 180 degrees and repeat steps A.5 through A.10.
11. Place the transducer on the machined pads oriented 90 degrees from a line between the two azimuth alignment pins on the Alignment Certification Fixture (Talyvel position No. 2 shown in figure 1).
12. Repeat steps A.5 through A.7.
13. Monitor and note the meter indication using the most sensitive scale possible. If the meter indication is within ±2 arc seconds of zero, proceed to step A.16; if not, adjust one of the two micrometer knobs, as required, to set the meter indication to one-half of the value noted.
14. Adjust the single rear leveling pad on the Alignment Certification Fixture to set the meter indication to zero.
15. Rotate the transducer 180 degrees and repeat steps A.12 through A.15.
16. Remove the Talyvel transducer and meter.
17. Attach the theodolite to the Theodolite Base Assembly and position the base assembly as shown in figure 1 such that the vertical axis of the theodolite is approximately 12-3/4 inches from the Alignment Certification Fixture azimuth alignment pins and 1-1/2 inches to the left of the right alignment pin as viewed from the end of the Alignment Certification Fixture closest to the alignment pins.
18. Energize the theodolite reticle and adjust the objective focus to infinity (adjustment knob fully clockwise).

NOTE: The theodolite reticle shall have been energized for at least 15 minutes prior to performing step A.21.

19. Level the theodolite base to the plate spirit level and the theodolite telescope to the altitude level.
20. Carefully place the Alignment Tool on the Alignment Certification Fixture with the reference surface against the azimuth alignment pins as shown in figure 1.
21. Sight through the theodolite eyepiece and adjust the theodolite in azimuth and elevation

DATE ______

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as required until the image reflected from the Alignment Tool is visible.

22. Clamp the theodolite coarse azimuth and elevation controls
23. Sight through the theodolite eyepiece and adjust the theodolite in azimuth and elevation using the fine positioning controls, as required, until the theodolite reticle is aligned to the reflected image.
24. Read the azimuth indication of the theodolite five times, offsetting the theodolite in azimuth and realigning the reticle to its reflected image before each reading. Record the average of the five readings.
25. Loosen the theodolite coarse elevation control, sight through the theodolite eyepiece, and depress the theodolite telescope until the image reflected from the Azimuth Monitor Mirror is visible.
26. Clamp the theodolite coarse elevation control.
27. Repeat steps A.23 and A.24.
28. Remove the Alignment Tool.
29. Inspect the Alignment Mirror Assembly (AMA) mounting pads to insure that they are not damaged and are free of dirt. Carefully wipe pads with lint free lens paper or a camel's hair brush.

NOTE: Extreme care must be exercised in step A.30 to prevent damage to mounting pads and alignment pins or disturbance of Alignment Certification Fixture position.

30. Loosen the two positioning clamp screws on the AMA (see figure 2) sufficiently to allow assembly to pass over the azimuth alignment pins on the Alignment Certification Fixture. Position the AMA carefully on the Alignment Certification Fixture with the position adjusting blocks against the azimuth alignment pins.
31. Tighten the two positioning clamp screws snug to hold the adjusting blocks firmly against the azimuth alignment pins on the Alignment Certification Fixture..
32. Tighten the 4 captive screws on the Alignment Mirror Assembly to the Alignment Certification Fixture to finger tightness.
33. Tighten the two positioning clamp screws to a torque of 9 (±0.5) pound-inches as shown in figure 2. Tighten the 45° positioning clamp first.
34. In increments of approximately 20 pound-inches and using a uniform torquing pattern (1, 3, 2, 4) as shown in figure 2, tighten the 4 captive screws on the Alignment Mirror Assembly to the Alignment Certification Fixture to a torque of 100 (±5) pound-inches.
35. Repeat steps A.23 and A.24.
36. Subtract the average of the five readings recorded in step A.35 (A.24) from the average of the five readings recorded in step A.27 (A.24) and record. If magnitude of the recorded value is

DATE ______

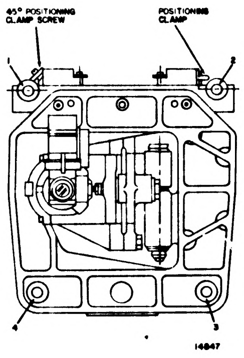

Figure 2. Mounting and Torquing Sequence

greater than 10 seconds, remove the AMA from the Alignment Certification Fixture and repeat steps A.19 through A.36. If the magnitude of recorded value is less than or equal to 10 seconds proceed to step A.37.

37. Subtract the value recorded in step A.36 from the value recorded in step A.24 and record.

38. Adjust the theodolite azimuth fine positioning control until the theodolite azimuth indicator indicates the value recorded in step A.37.

39. Loosen the theodolite coarse elevation control and depress the theodolite telescope to approximately 33 degrees from horizontal. Clamp the elevation axis.

40. Set the pellicle detent on the AMA to the 28.5° position.

41. Position the Light Housing of the AMA autocollimator parallel to a line between the two azimuth alignment pins such that the Light Housing points to the right as viewed from the end of the Certification Fixture closest to the alignment pins.

B. PROCEDURE

> NOTE: To determine AMA autocollimator micrometer indications in steps B.1, B.4 and B.6, take the average of a set of five readings, offsetting the micrometer drum before each reading. Always approach the final setting through clockwise rotation of the micrometer drum.

1. Sight through the AMA autocollimator and adjust the micrometer drum so that the adjustable filar reticle is aligned to the projected reticle of the theodolite. Adjust the theodolite in elevation if required (assuming that the azimuth indication does not change

DATE ________

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from the value recorded in step A.37). Record the AMA autocollimator micrometer indication as ZR_z.

2. Turn off the theodolite reticle.

3. Energize the AMA autocollimator reticle and place the mercury pool directly under the autocollimator line of sight. Wait at least 15 minutes before performing step B.4.

4. Sight through the AMA autocollimator and adjust the micrometer drum so that the adjustable filar reticle is centered on the return image of the fixed reticle. Record the autocollimator micrometer indication as ZR_x.

5. Position the Light Housing of the AMA autocollimator perpendicular to and pointing toward a line between the two azimuth alignment pins.

6. Sight through the AMA autocollimator and adjust the micrometer drum so that the adjustable filar reticle is centered on the return image of the fixed reticle. Record the autocollimator micrometer indication as ZR_y.

7. Remove and store the theodolite, Theodolite Base Assembly, Talyvel, Alignment Tool and mercury pool.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 2

JDC
NO. 10739
REV. A
INITIAL TDRR 19950

JOB CALIBRATION OF ALIGNMENT MIRROR ASSEMBLY

ASSEMBLY UNDER TEST

TITLE ____________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ (START) ______ (END) ______ (SITE / LOCATION)
TIME ______ (START) ______ (END) ______ (TOTAL ELAPSED)

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ ______ (CAL DATE)
NAME ____________ SER. NO. ______ ______ (CAL DATE)

CONDUCTED BY ____________ (NAME/AFFILIATION) APPROVED BY ____________ (NAME/AFFILIATION)

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A.24	Azimuth Indication (Alignment Tool)	deg min sec	▨	° ' "	▨	▨	▨
A.27 (A.24)	Azimuth Indication (Azimuth Monitor Mirror)	deg min sec	▨	° ' "	▨	▨	▨
A.35 (A.24)	Azimuth Indication (Azimuth Monitor Mirror)	deg min sec	▨	° ' "	▨	▨	▨
A.36	[A.27(A.24)] - [A.35(A.24)]	sec	-10	"	+10		
A.37	A.24 - A.36	deg min sec	▨	° ' "	▨	▨	▨
B.1	ZR_z	min sec	▨	' "	▨	▨	▨

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 2

JDC
NO. 10739
REV. A

JOB CALIBRATION OF ALIGNMENT MIRROR ASSEMBLY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.4	ZR_x	min sec	▨	' "	▨	▨	▨
B.6	ZR_y	min sec	▨	' "	▨	▨	▨

DATE ________

JOB CALIBRATION OF ALIGNMENT MIRROR ASSEMBLY | JDC 10739 REV. PAGE 1 OF 5
INITIAL TDRR 19950 D.S. PGS 1

SUBSYSTEM OPTICAL | ASSY.

DESCRIPTION Zero reference positions of the Alignment Mirror Assembly autocollimator dial are obtained for use in the Optics-Nav. Base alignment checks.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Mercury pool

A. PREPARATION

1. Assure that the Alignment Certification Fixture is resting on a suitably stable surface.
2. Inspect the Alignment Certification Fixture mounting pads and azimuth alignment pins to insure that they are not damaged and are free of dirt. Carefully wipe pads and pins with lint free lens paper or a camel's hair brush.
3. Connect the transducer of the Electronic Level (Talyvel) to the meter. Set the meter selector switch to the "8" (minutes scale) position and depress the BATTERY VOLTS button inside the rear access door of the Talyvel meter. The meter dial shall deflect past the red battery test mark. If not, replace the batteries.
4. Place the transducer on the machined pads between the two azimuth alignment pins on the Alignment Certification Fixture (Talyvel position No. 1 shown in figure 1).
5. Set both micrometer adjust knobs on the transducer to zero by aligning the zero indications on the drums to the centers of the top horizontal scribe marks on the shafts.
6. Adjust one of the two micrometer adjustment knobs on the transducer, as required, in the clockwise direction to set the meter indication to zero. Note both micrometer settings.
7. Rotate the transducer 180 degrees.

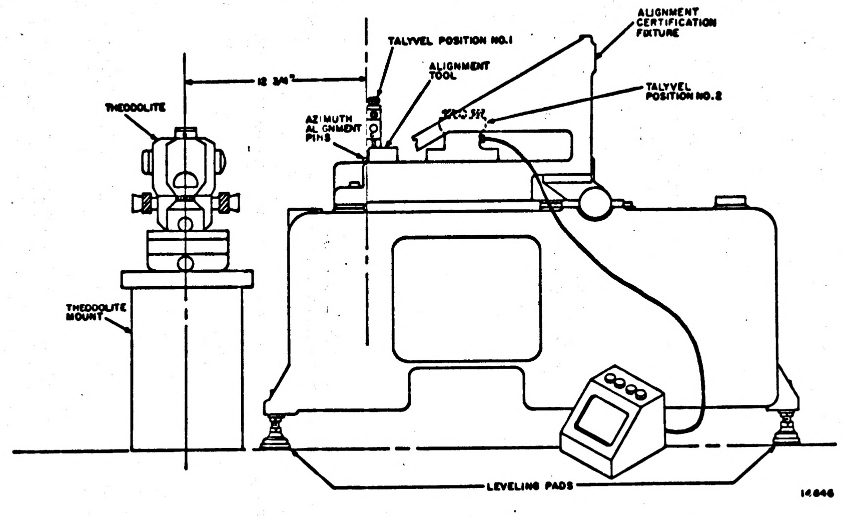


Figure 1. Alignment Equipment Location

NOTE: If the meter pointer is off-scale on the 8 arc minute scale in steps A.8 or A.13, adjust the required micrometer knob in the clockwise direction until the meter indication is zero. Note the difference between the initial and final indications of the adjusted micrometer.

8. Monitor and note the meter indication using the most sensitive scale possible. If the meter indication is within ±2 arc seconds of zero, proceed to step A.11; if not, adjust one of the two micrometer knobs, as required, to set the meter indication to one-half of the value noted.
9. Adjust one of the two front leveling pads on the Alignment Certification Fixture to set the meter indication to zero.
10. Rotate the transducer 180 degrees and repeat steps A.5 through A.10.
11. Place the transducer on the machined pads oriented 90 degrees from a line between the two azimuth alignment pins on the Alignment Certification Fixture (Talyvel position No. 2 shown in figure 1).
12. Repeat steps A.5 through A.7.
13. Monitor and note the meter indication using the most sensitive scale possible. If the meter indication is within ±2 arc seconds of zero, proceed to step A.15; if not, adjust one of the two micrometer knobs, as required, to set the meter indication to one-half of the value noted.
14. Adjust the single rear leveling pad on the Alignment Certification Fixture to set the meter indication to zero.
15. Remove the Talyvel transducer and meter.
16. Attach the theodolite to the Theodolite Base Assembly and position the base assembly as shown in figure 1 such that the vertical axis of the theodolite is approximately 12-3/4 inches from the Alignment Certification Fixture azimuth alignment pins and 1-1/2 inches to the left of the right alignment pin as viewed from the end of the Alignment Certification Fixture closest to the alignment pins.
17. Energize the theodolite reticle and adjust the objective focus to infinity (adjustment knob fully clockwise).

NOTE: The theodolite reticle shall have been energized for at least 15 minutes prior to performing step A.20.

18. Level the theodolite base to the plate spirit level and the theodolite telescope to the altitude level.
19. Carefully place the Alignment Tool on the Alignment Certification Fixture with the reference surface against the azimuth alignment pins as shown in figure 1.

20. Sight through the theodolite eyepiece and adjust the theodolite in azimuth and elevation, as required, until the theodolite reticle is aligned to the image reflected from the Alignment Tool. Record the horizontal scale reading of the theodolite.
21. Clamp the azimuth axis of the theodolite, assuring that the horizontal scale reading does not change.
22. Remove the Alignment Tool.
23. Depress the theodolite telescope through approximately 33 degrees as indicated by the vertical scale. Clamp the elevation axis.
24. Inspect the Alignment Mirror Assembly (AMA) mounting pads to insure that they are not damaged and are free of dirt. Carefully wipe pads with lint free lens paper or a camel's hair brush.

NOTE: Extreme care must be exercized in step A.25 to prevent damage to mounting pads and alignment pins or disturbance of Alignment Certification Fixture position.

25. Loosen the two positioning clamp screws on the AMA (see figure 2) sufficiently to allow assembly to pass over the azimuth alignment pins on the Alignment Certification Fixture. Position the AMA carefully on the Alignment Certification Fixture with the position adjusting blocks against the azimuth alignment pins.
26. Tighten the two positioning clamp screws snug to hold the adjusting blocks firmly against the azimuth alignment pins on the Alignment Certification Fixture.
27. Tighten the 4 captive screws on the Alignment Mirror Assembly to the Alignment Certification Fixture to finger tightness.
28. Tighten the two positioning clamp screws to a torque of 9 (±0.5) pound-inches as shown in figure 2. Tighten the 45° positioning clamp first.
29. In increments of approximately 20 pound-inches and using a uniform torquing pattern (1, 3, 2, 4) as shown in figure 2, tighten the 4 captive screws on the Alignment Mirror Assembly to the Alignment Certification Fixture to a torque of 100 (±5) pound-inches.

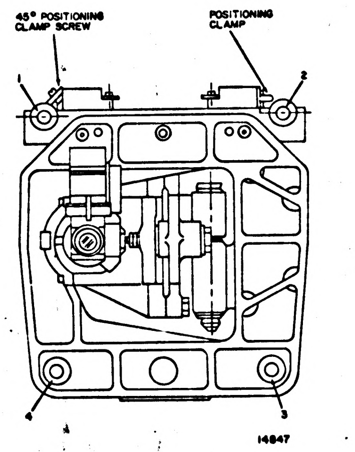


Figure 2. Mounting and Torquing Sequence

JOB CALIBRATION OF ALIGNMENT MIRROR ASSEMBLY

JDC 10739 REV PAGE 5 OF 5

SUBSYSTEM OPTICAL

ASSY

30. Set the pellicle detent on the AMA to the 28.5° position.

31. Position the Light Housing of the AMA autocollimator parallel to a line between the two azimuth alignment pins such that the Light Housing points to the right as viewed from the end of the Certification Fixture closest to the alignment pins.

B. PROCEDURE

> NOTE: To determine AMA autocollimator micrometer indications in steps B.1, B.4 and B.6, take the average of a set of five readings, offsetting the micrometer drum before each reading. Always approach the final setting through clockwise rotation of the micrometer drum.

1. Sight through the AMA autocollimator and adjust the micrometer drum so that the adjustable filar reticle is aligned to the projected reticle of the theodolite. Adjust the theodolite in elevation if required (assuring that the horizontal scale indication does not change from the value recorded in step A.20). Record the AMA autocollimator micrometer indication as ZR_z.

2. Turn off the theodolite reticle.

3. Energize the AMA autocollimator reticle and place the mercury pool directly under the autocollimator line of sight. Wait at least 15 minutes before performing step B.4.

4. Sight through the AMA autocollimator and adjust the micrometer drum so that the adjustable filar reticle is centered on the return image of the fixed reticle. Record the autocollimator micrometer indication as ZR_x.

5. Position the Light Housing of the AMA autocollimator perpendicular to and pointing toward a line between the two azimuth alignment pins.

6. Sight through the AMA autocollimator and adjust the micrometer drum so that the adjustable filar reticle is centered on the return image of the fixed reticle. Record the autocollimator micrometer indication as ZR_y.

7. Remove and store the theodolite, Theodolite Base Assembly, Talyvel, Alignment Tool and mercury pool.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 10739 JDC
REV. ______
INITIAL TDRR 19950

JOB CALIBRATION OF ALIGNMENT MIRROR ASSEMBLY

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ ______ CAL DATE

NAME ____________ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A.20	Theodolite horizontal scale	deg min sec	▨	° ' "	▨	▨	▨
B.1	ZR_z	min sec	▨	' "	▨	▨	▨
B.4	ZR_x	min sec	▨	' "	▨	▨	▨
B.6	ZR_y	min sec	▨	' "	▨	▨	▨

DATE ________

Released with FTM1007522

JOB: WORKMANSHIP-VIBRATION TEST
JDC: 11043 **REV:** — **PAGE** 1 **OF** 2
INITIAL TDRR: 18919 **DS. PGS.** 1
TWO SPEED SWITCH
SUBSYSTEM: MODULE ASSEMBLY
ASSY:
DESCRIPTION:

Test to determine assembly workmanship.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES:
FTM1007522

IMPORTANT:

INTERVAL:

TOOLS AND MATERIAL:

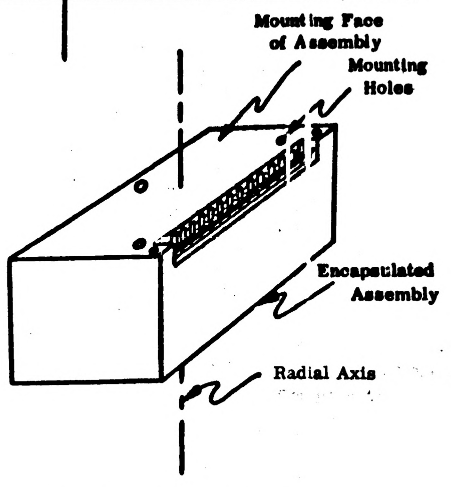
A. PREPARATION

1. Place assembly in vibration fixture to vibrate along the radial axis of the encapsulated components as shown in the figure.

2. Connect pins 21 to 8, 1 to 24, 13 to 16, 9 to 12, 23 to 22, and 11 to 14.

3. The test conditions and recommended test setup shall be as specified in Specification FTM1007522.

4. Apply a 3.00±0.03V rms 800 cps signal between pins 1 (Hi) and 22 (Lo) and between 9 (Hi) and 14 (Lo).



RADIAL AXIS OF COMPONENTS

LOC. OF MSTR. ACS

DATE ____

JOB: WORKMANSHIP-VIBRATION TEST
JDC: 11043 **REV:** — **PAGE** 2 **OF** 2
TWO SPEED SWITCH
SUBSYSTEM: MODULE ASSEMBLY
ASSY:

B. PROCEDURE

1. Monitor the output voltage between the following pins with electrical measuring equipment capable of measuring out-of-tolerance conditions which exist for a period of 1 msec.

18 (Hi) and 10 (Lo)
19 (Hi) and 10 (Lo)
17 (Hi) and 2 (Lo)
5 (Hi) and 2 (Lo)
15 (Hi) and 2 (Lo)
20 (Hi) and 10 (Lo)

2. Vibrate the assembly with simple harmonic motion swept from 10 to 1000 cps at a rate of one octave per 15 seconds. The magnitude of vibration shall be 6.0g rms limited to a 0.4 inch pp constant displacement from 10 cps to the crossover frequency.

C. RECORD

Use Data Sheet 11043 to record:

1. The output voltage deviations during vibration that are ≥ 10 percent.

2. Discrepancies in assembly workmanship evident after vibration.

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

JDC NO. 11043
REV. —
INITIAL TDRR 18919

JOB WORKMANSHIP-VIBRATION TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ **DWG.** ____ **REV.** ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ **SER. NO.** ____ CAL. DATE ____
NAME ____ **SER. NO.** ____ CAL. DATE ____

CONDUCTED BY ____ NAME /AFFILIATION **APPROVED BY** ____ NAME / AFFILIATION

OUTPUT PINS		ALLOWABLE OUTPUT DEVIATION DURING VIBRATION (%)	ONLY OUTPUT DEVIATION ≥ 10% DURING VIBRATION (%)
Hi	Lo		
18	10	10 max	
19	10	10 max	
17	2	10 max	
5	2	10 max	
15	2	10 max	
20	10	10 max	

DISCREPANCIES IN WORKMANSHIP:

DATE ____

Released with FTM1007522

JOB: COARSE CHANNEL GAIN TEST

JDC: 11045 **REV:** — **PAGE** 1 **OF** 1

INITIAL TDRR: 18919 **D.S. PGS.** 1

SUBSYSTEM: TWO SPEED SWITCH MODULE ASSEMBLY

ASSY:

DESCRIPTION:
Determine the coarse channel gain for specified input signals.

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES:
FTM1007522

IMPORTANT:

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. The test conditions and recommended test setup shall be as specified in Specification FTM1007522

B. PROCEDURE

1. Channel A:

   (a) Apply an 800±2 cps signal at successive amplitudes between pins 1 (Hi) and 22 (Lo) as specified on Data Sheet 11045.

   (b) Measure the output, V_1, between pins 18 (Hi) and 10(Lo), for each of the specified input amplitudes.

2. Channel B:

   (a) Apply an 800±2 cps signal at successive amplitudes between pins 9 (Hi) and 14(Lo) as specified on Data Sheet 11045.

   (b) Measure the output voltage, V_3, between pins 17(Hi) and 2 (Lo), for each of the specified input amplitudes.

C. RECORD
Use Data Sheet 11045 to record:
The output voltage of each coarse channel for each of the specified input signals.

DATE________

LOC. OF MSTR. ACS

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

JDC NO. 11045
REV. —
INITIAL TDRR 18919

JOB COARSE CHANNEL GAIN

ASSEMBLY UNDER TEST

TITLE ____________________

SER. NO. ________ DWG. ________ REV. ___

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________________ SER. NO. ________ CAL. DATE ________

NAME ____________________ SER. NO. ________ CAL. DATE ________

CONDUCTED BY ____________________ NAME /AFFILIATION

APPROVED BY ____________________ NAME / AFFILIATION

INPUT SIGNAL (V pp±5%) (800±2 cps)	OUTPUT VOLTAGE REQUIRED (V pp) (800±2 cps)	OUTPUT VOLTAGE OBTAINED (V pp)	
		Channel A (Pin 18 to 10)	Channel B (Pin 17 to 2)
0.1	0.001 max		
0.4	0.005 max		
1.56	0.39 - 0.71		
30	24 - 30		
70	24 - 30		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

JDC	
NO.	11046
REV.	—
INITIAL TDRR	18919

JOB FINE CHANNEL GAIN

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ **DWG.** ______ **REV.** ___

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ **SER. NO.** ______ ______ CAL. DATE

NAME ______ **SER. NO.** ______ ______ CAL. DATE

CONDUCTED BY ______ NAME / AFFILIATION **APPROVED BY** ______ NAME / AFFILIATION

INPUT SIGNAL (V pp±5%) (800±2 cps)	SHORTS APPLIED		OUTPUT VOLTAGE REQUIRED (V pp)		OUTPUT VOLTAGE OBTAINED (V pp)
	From	To	Min	Max	
CHANNEL A					
0.3			0.24	0.30	
0.6			0.48	0.60	
1.0			0,80	0.98	
1.5			1.21	1.49	
2.5			2.02	2.48	
13.0			2.4	4.8	
13.0	20	10	1.6	3.2	
13.0	20	19	0.8	1.6	
CHANNEL B					
0.3			0.24	0.3	
0.6			0.48	0.6	
1.0			0.80	0.98	
1.5			1.21	1.49	
2.5			2.02	2.48	
13.0			2.4	4.8	
13.0	15	2	1.6	3.2	
13.0	15	5	0.8	1.6	

DATE ______

Released with FTM1007522

JOB: FINE CHANNEL GAIN TEST

JDC: 11046 **REV:** — **PAGE** 1 **OF** 1
INITIAL TDRR: 18919 **D.S. PGS:** 1

SUBSYSTEM: TWO SPEED SWITCH MODULE ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine fine channel gain.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES:
FTM1007522

IMPORTANT:

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

The test conditions and recommended test setup shall be as specified in Specification FTM1007522.

B. PROCEDURE

1. Fine Channel A:
   - (a) Connect pin 1 to pin 22.
   - (b) Apply an 800+2 cps signal between pins 8 (Hi) and 22 (Lo) as specified in Data Sheet 11046, with the required short applied as specified.
   - (c) Measure the output voltage (V_2) between pins 19(Hi) and 10(Lo).
2. Fine Channel B:
   - (a) Connect pin 9 to pin 14.
   - (b) Apply an 800±2 cps signal between pins 16(Hi) and 14(Lo) as specified on Data Sheet 11046, with the required short applied as specified.
   - (c) Measure the output voltage (V_4) between pins 5 (Hi) and 2 (Lo).

C. RECORD

Use Data Sheet 11046 to record:
The output voltage of each fine channel.

DATE ______

LOC. OF MSTR. ACS

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

NO. 11048 **JDC**
REV. —
INITIAL TDRR /18919

JOB INPUT TUNING CAPACITORS TEST

ASSEMBLY UNDER TEST

TITLE ____________________

SER. NO. ________ **DWG.** ________ **REV.** ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________________ **SER. NO.** ________ ________ CAL. DATE

NAME ____________________ **SER. NO.** ________ ________ CAL. DATE

CONDUCTED BY ____________________ NAME /AFFILIATION **APPROVED BY** ____________________ NAME / AFFILIATION

JDC STEP	PIN	PHASE SHIFT (Degrees)*		
		LIMIT		
		Min	Max	Actual
B2	1	−35	−55	
B4	9	−35	−55	
B6	8	−35	−55	
B8	16	−35	−55	

*Phase shift at pin specified with respect to the signal applied to the corresponding input resistor.

DATE ________

Released with FTM1007522

JOB: INPUT TUNING CAPACITOR TEST

JDC: 11048 **REV:** — **PAGE** 1 **OF** 2
INITIAL TDRR: 18919 **DS. PGS.** 1

SUBSYSTEM: TWO-SPEED SWITCH MODULE ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine correct connection of C1, C2, C3 and C4 capacitors.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES:

FTM1007522

IMPORTANT:

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

The test conditions and recommended test setup shall be as specified in Specification FTM1007522.

B. PROCEDURE

1. Apply a 200±2 mv rms 800 cps sine wave signal through a series 549 ohm ±1 percent resistor between pin 1 (hi) and pin 22 (lo).
2. Measure the phase shift at pin 1 with respect to the input signal applied to the 549 ohm series resistor.
3. Apply a 200±2 mv rms 800 cps sine wave signal through a series 634 ohm ±1 percent resistor between pin 9 (hi) and pin 14 (lo).
4. Measure the phase shift at pin 9 with respect to the input signal applied to the 634 ohm series resistor.
5. Apply a 200±2 mv rms, 800 cps sine wave signal through a series 1.43K ohm ±1 percent resistor between pin 8 (hi) and pin 22 (lo).
6. Measure the phase shift at pin 8 with respect to the input signal applied to the 1.43K ohm resistor.

LOC. OF MSTR. ACS

DATE ________

JOB: INPUT TUNING CAPACITOR TEST

JDC: 11048 **REV:** — **PAGE** 2 **OF** 2

SUBSYSTEM: TWO-SPEED SWITCH MODULE ASSEMBLY

ASSY:

7. Apply a 200±2 mv rms, 800 cps sine wave signal through a series 3.57K ohm ±1 percent resistor to pin 16.
8. Measure the phase shift at pin 16 with respect to the input signal applied to the 3.57K ohm resistor.

C. RECORD

Use Data Sheet 11048 to record the phase shifts measured in B2, B4, B6, and B8.

DATE ________

Released with ATP 1007570 TDRR 16920 MAR 2 1965

JOB: OPTICS SHAFT AXIS CDU MOTOR DRIVE TEST

JDC: 11290 REV: A PAGE 1 OF 2

INITIAL TDRR: ______ DS. PGS. 1

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine amplifier output.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-65	21502		1	WK	WM

REFERENCES:

IMPORTANT:
Return all connections to original conditions upon conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply 27.5±0.1 vdc between pins A10P1-T5 and A10P1-P4.
2. Disconnect pin A9P1-B8 from pin A9P1-B7.
3. Apply an 800 cps test signal between pins A9P1-B8 and A9P1-B7.

B. PROCEDURE

1. Adjust the 800 cps signal to obtain a 12V rms output between pins A9P1-S2 and A9P1-T2.

   NOTE: Adjust the test signal amplitude and phase (π or 0), so that the voltage from pin A9P1-S2 to pin A9P1-T2 can be nulled if there is an output with no signal applied. Increase the test signal so that the voltage from pin A9P1-S2 to pin A9P1-T2 passes through the null, reverses phase and is increased to 12V rms.

2. Measure the signal between the pins specified in Table I.

TABLE I

TEST PINS

STEP	HIGH	LOW
a	A9P1-S2	A9P1-T2
b	A9P1-B8	A9P1-B7

DATE ______

JOB: OPTICS SHAFT AXIS CDU MOTOR DRIVE TEST TDRR 16920 MAR 2 1965

JDC: 11290 REV: A PAGE 2 OF 2

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

3. Adjust the 800 cps test signal to obtain a 5V rms output between pins A9P1-S2 and A9P1-T2.
4. Measure the 800 cps test signal voltage at pins A9P1-B8 and A9P1-B7.
5. Calculate the difference between the voltages recorded in B.2.b and B.4.
6. Adjust the 800 cps test signal for 0.10V rms between pins A9P1-B8 and A9P1-B7.
7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

STEP	HIGH	LOW
a	A9P1-M3	A9P1-L3
b	A9J1-18	A9J1-19

8. Disconnect pin A9P1-A9 from pin A9P1-B9.
9. Apply an 800 cps, modulated test signal source between pins A9P1-A9 and A9P1-B9.
10. Adjust the 800 cps test signal from pins A9P1-B8 and A9P1-B7 to obtain a null at pins A9P1-S2 and A9P1-T2 with the modulated test signal set at zero volts.
11. Adjust the 800 cps, modulated test signal to obtain a 35V pp output between pins A9P1-S2 and A9P1-T2.
12. Measure the signal between pins A9P1-A9 and A9P1-B9.
13. Remove the 800 cps test signal from pins A9P1-B8 and A9P1-B7.
14. Connect pins A9P1-B8 and A9P1-B7.
15. Remove the 800 cps modulated test signal from pins A9P1-A9 and A9P1-B9.
16. Apply a 0.10V, 800 cps test signal between pins A9P1-A9 and A9P1-B9.
17. Measure the output between the pins specified in Table III.

TABLE III

TEST PINS

STEP	HIGH	LOW
a	A9P1-M4	A9P1-L4
b.	A9J1-2	A9J1-1

18. Remove the 800 cps test signal from pins A9P1-A9 and A9P1-B9.
19. Connect pins A9P1-A9 and A9P1-B9.
20. Disconnect pin A9P1-C8 from pin A9P1-C9.
21. Apply an 800 cps test signal between pins A9P1-C8 and A9P1-C9.
22. Adjust the test signal to 9V rms, between pins A9P1-C8 and A9P1-C9.
23. Measure the output from between pins A9P1-S2 and A9P1-T2.

C. RECORD

Use Data Sheet 11290 to record:

1. Voltage
2. Phase

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

TDRR 16920 MAR 2 1965

JDC NO. 11290
REV. A
INITIAL TDRR ______

JOB OPTICS SHAFT AXIS CDU MOTOR DRIVE TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG. ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE/LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______

NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC STEP	PINS		VOLTAGE (V RMS)			PHASE WITH RESPECT TO INPUT		
	High	Low	Minimum	Maximum	Actual	Minimum	Maximum	Actual
B.2.a	A9P1-S2	A9P1-T2	-	-		-18°	+18°	
B.2.b	A9P1-B8	A9P1-B7	(Record)	(Record)		-	-	
B.4	A9P1-B8	A9P1-B7	(Record)	(Record)		-	-	
B.5	A9P1-B8	A9P1-B7	0.0028	0.0065		-	-	
B.7.a	A9P1-M3	A9P1-L3	0.089	0.109		-10°	+10°	
B.7.b	A9J1-18	A9J1-19	0.089	0.109		-	-	
B.12	A9P1-A9	A9P1-B9	0.05*	0.15*		-	-	
B.17.a	A9P1-M4	A9P1-L4	0.089	0.109		-10°	+10°	
B.17.b	A9J1-2	A9J1-1	0.089	0.109		-	-	
B.23	A9P1-S2	A9P1-T2	30.0	-		-35°	+35°	

*volts peak to peak

DATE ______

Released with ATP 1007570 TDRR 16920 MAR 2 1965

JOB: OPTICS SHAFT AXIS CDU MOTOR DRIVE TEST

JDC: 11290 REV: B PAGE 1 OF 2

INITIAL TDRR: ______ D.S. PGS. 1

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine amplifier output.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	AC	NASA
(M) A	8-10-65	21502		1	WK	WM
B	6- -67	33955		1	MGM EA	—

REFERENCES:

IMPORTANT:
Return all connections to original conditions upon conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply 27.5±0.1 vdc between pins A10P1-T5 and A10P1-P4.
2. Disconnect pin A9P1-B8 from pin A9P1-B7.
3. Apply an 800 cps, test signal between pins A9P1-B8 and A9P1-B7.

B. PROCEDURE

1. Adjust the 800 cps signal to obtain a 12V rms output between pins A9P1-S2 and A9P1-T2.

   NOTE: Adjust the test signal amplitude and phase (π or 0), so that the voltage from pin A9P1-S2 to pin A9P1-T2 can be nulled if there is an output with no signal applied. Increase the test signal so that the voltage from pin A9P1-S2 to pin A9P1-T2 passes through the null, reverses phase and is increased to 12V rms.

2. Measure the signal between the pins specified in Table I.

TABLE I

TEST PINS

STEP	HIGH	LOW
a	A9P1-S2	A9P1-T2
b	A9P1-B8	A9P1-B7

DATE ______

JOB: OPTICS SHAFT AXIS CDU MOTOR DRIVE TEST TDRR 16920

MAR 2 1965

JDC: 11290 REV: B PAGE 2 OF 2

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

3. Adjust the 800 cps test signal to obtain a 5V rms output between pins A9P1-S2 and A9P1-T2.
4. Measure the 800 cps test signal voltage at pins A9P1-B8 and A9P1-B7.
5. Calculate the difference between the voltages recorded in B.2.b and B.4.
6. Adjust the 800 cps test signal for 0.10V rms between pins A9P1-B8 and A9P1-B7.
7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

STEP	HIGH	LOW
a	A9P1-M3	A9P1-L3
b	A9J1-18	A9J1-19

8. Disconnect pin A9P1-A9 from pin A9P1-B9.
9. Apply an 800 cps, modulated test signal source between pins A9P1-A9 and A9P1-B9.
10. Adjust the 800 cps test signal from pins A9P1-B8 and A9P1-B7 to obtain a null at pins A9P1-S2 and A9P1-T2 with the modulated test signal set at zero volts.
11. Adjust the 800 cps, modulated test signal to obtain a 35V pp output between pins A9P1-S2 and A9P1-T2.
12. Measure the signal between pins A9P1-A9 and A9P1-B9.
13. Remove the 800 cps test signal from pins A9P1-B8 and A9P1-B7.
14. Connect pins A9P1-B8 and A9P1-B7.
15. Remove the 800 cps modulated test signal from pins A9P1-A9 and A9P1-B9.
16. Apply a 0.10V, 800 cps test signal between pins A9P1-A9 and A9P1-B9.
17. Measure the output between the pins specified in Table III.

TABLE III

TEST PINS

STEP	HIGH	LOW
a	A9P1-M4	A9P1-L4
b.	A9J1-2	A9J1-1

18. Remove the 800 cps test signal from pins A9P1-A9 and A9P1-B9.
19. Connect pins A9P1-A9 and A9P1-B9.
20. Disconnect pin A9P1-C8 from pin A9P1-C9.
21. Apply an 800 cps, test signal between pins A9P1-C8 and A9P1-C9.
22. Adjust the test signal to 9V rms, between pins A9P1-C8 and A9P1-C9.
23. Measure the output from between pins A9P1-S2 and A9P1-T2.

C. RECORD

Use Data Sheet 11290 to record:

1. Voltage
2. Phase

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

TDRR 16920 MAR 2 1965

JDC
NO. 11290
REV. B
INITIAL TDRR ______

JOB OPTICS SHAFT AXIS CDU MOTOR DRIVE TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG. ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE/LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL. DATE

NAME ______ SER. NO. ______ CAL. DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC STEP	PINS		VOLTAGE (V RMS)			PHASE WITH RESPECT TO INPUT		
	High	Low	Minimum	Maximum	Actual	Minimum	Maximum	Actual
B.2.a	A9P1-S2	A9P1-T2	-	-		+18°	+18°	
B.2.b	A9P1-B8	A9P1-B7	(Record)	(Record)		-	-	
B.4	A9P1-B8	A9P1-B7	(Record)	(Record)		-	-	
B.5	A9P1-B8	A9P1-B7	0.0028	0.0055		-	-	
B.7.a	A9P1-M3	A9P1-L3	0.089	0.109		-10°	+10°	
B.7.b	A9J1-18	A9J1-19	0.089	0.109		-	-	
B.12	A9P1-A9	A9P1-B9	0.05*	0.15*		-	-	
B.17.a	A9P1-M4	A9P1-L4	0.089	0.109		-10°	+10°	
B.17.b	A9J1-2	A9J1-1	0.089	0.109		-	-	
B.23	A9P1-S2	A9P1-T2	27.0	-		+35°	+35°	

*volts peak to peak

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

TDRR 16920 MAR 2 1965

JDC NO. 11290
REV. –
INITIAL TDRR ______

JOB OPTICS SHAFT AXIS CDU MOTOR DRIVE TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG. ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME / AFFILIATION APPROVED BY ______ NAME / AFFILIATION

JDC STEP	PINS		VOLTAGE (V RMS)			PHASE WITH RESPECT TO INPUT		
	High	Low	Minimum	Maximum	Actual	Minimum	Maximum	Actual
B.2.a	A9P1-S2	A9P1-T2	–	–		±18°	±18°	
B.2.b	A9P1-B8	A9P1-B7	(Record)	(Record)		–	–	
B.4	A9P1-B8	A9P1-B7	(Record)	(Record)		–	–	
B.5	A9P1-B8	A9P1-B7	0.0028	0.0056		–	–	
B.7.a	A9P1-M3	A9P1-L3	0.089	0.109		-10°	+10°	
B.7.b	A9J1-18	A9J1-29	0.089	0.109		–	–	
B.12	A9P1-A9	A9P1-B9	0.225*	0.750*		–	–	
B.17.a	A9P1-M4	A9P1-L4	0.089	0.109		-10°	+10°	
B.17.b	A9J1-27	A9J1-24	0.089	0.109		–	–	
B.23	A9P1-S2	A9P1-T2	30.0	–		±35°	±35°	

*volts peak to peak

DATE ______

Released with ATP 1007570 TDRR 16920 MAR 2 1965

JOB: OPTICS SHAFT AXIS CDU MOTOR DRIVE TEST
JDC: 11290 REV: – PAGE 1 OF 2
INITIAL TDRR: ______ DS. PGS. 1
SUBSYSTEM: POWER AND SERVO ASSEMBLY
ASSY:

DESCRIPTION:

Test to determine amplifier output.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES:

IMPORTANT:
Return all connections to original conditions upon conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply 27.5±0.1 vdc between pins A10P1-T5 and A10P1-P4.
2. Disconnect pin A9P1-B8 from pin A9P1-B7.
3. Apply an 800 cps, test signal between pins A9P1-B8 and A9P1-B7.

B. PROCEDURE

1. Adjust the 800 cps signal to obtain a 12V rms output between pins A9P1-S2 and A9P1-T2.

   NOTE: Adjust the test signal amplitude and phase (π or 0), so that the voltage from pin A9P1-S2 to pin A9P1-T2 can be nulled if there is an output with no signal applied. Increase the test signal so that the voltage from pin A9P1-S2 to pin A9P1-T2 passes through the null, reverses phase and is increased to 12V rms.

2. Measure the signal between the pins specified in Table I.

TABLE I

TEST PINS

STEP	HIGH	LOW
a	A9P1-S2	A9P1-T2
b	A9P1-B8	A9P1-B7

DATE ______

JOB: OPTICS SHAFT AXIS CDU MOTOR DRIVE TEST TDRR 16920 MAR 2 1965
JDC: 11290 REV: – PAGE 2 OF 2
SUBSYSTEM: POWER AND SERVO ASSEMBLY
ASSY:

3. Adjust the 800 cps test signal to obtain a 5V rms output between pins A9P1-S2 and A9P1-T2.
4. Measure the 800 cps test signal voltage at pins A9P1-B8 and A9P1-B7.
5. Calculate the difference between the voltages recorded in B.2.b and B.4.
6. Adjust the 800 cps test signal for 0.10V rms between pins A9P1-B8 and A9P1-B7.
7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

STEP	HIGH	LOW
a	A9P1-M3	A9P1-L3
b	A9J1-18	A9J1-19

8. Disconnect pin A9P1-A9 from pin A9P1-B9.
9. Apply an 800 cps, modulated test signal source between pins A9P1-A9 and A9P1-B9.
10. Adjust the 800 cps test signal from pins A9P1-B8 and A9P1-B7 to obtain a null at pins A9P1-S2 and A9P1-T2 with the modulated test signal set at zero volts.
11. Adjust the 800 cps, modulated test signal to obtain a 35V pp output between pins A9P1-S2 and A9P1-T2.
12. Measure the signal between pins A9P1-A9 and A9P1-B9.
13. Remove the 800 cps test signal from pins A9P1-B8 and A9P1-B7.
14. Connect pins A9P1-B8 and A9P1-B7.
15. Remove the 800 cps modulated test signal from pins A9P1-A9 and A9P1-B9.
16. Apply a 0.10V, 800 cps test signal between pins A9P1-A9 and A9P1-B9.
17. Measure the output between the pins specified in Table III.

TABLE III

TEST PINS

STEP	HIGH	LOW
a	A9P1-M4	A9P1-L4
b.	A9J1-27	A9J1-24

18. Remove the 800 cps test signal from pins A9P1-A9 and A9P1-B9.
19. Connect pins A9P1-A9 and A9P1-B9.
20. Disconnect pin A9P1-C8 from pin A9P1-C9.
21. Apply an 800 cps, test signal between pins A9P1-C8 and A9P1-C9.
22. Adjust the test signal to 9V rms, between pins A9P1-C8 and A9P1-C9.
23. Measure the output from between pins A9P1-S2 and A9P1-T2.

[illegible]. Remove the test signal and connect pin A9P1-C8 to pin A9P1-C9.

C. RECORD

Use Data Sheet 11290 to record:

1. Voltage
2. Phase

DATE ______

- Released with ATP1007570

TDRR 16920

MAR 2 1965

JOB: OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

JDC: 11291 **REV:** A **PAGE** 1 **OF** 3

INITIAL TDRR: **DS. PGS.** 1

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine amplifier output.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-65	21499		1	WK	WM

REFERENCES:

IMPORTANT:
Return all connections to original conditions upon conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply a 27.5±0.1 vdc source between pins A10P1-T4 and A10P1-P4.
2. Disconnect A9P1-B5 from A9P1-B4.
3. Apply an 800 cps test signal between A9P1-B5 and A9P1-B4.

B. PROCEDURE

1. Adjust the 800 cps signal to obtain a 12V rms output between pins A9P1-S1 and A9P1-T1.

   NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A9P1-S1 and A9P1-T1 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A9P1-S1 and A9P1-T1 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between the pins specified in Table I.

TABLE I
TEST PINS

STEP	HIGH	LOW
a	A9P1-S1	A9P1-T1
b	A9P1-B5	A9P1-B4

DATE ________

JOB: OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

TDRR 1692

JDC: 11291 **REV:** A **PAGE** 2 **OF** 3

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

3. Adjust the 800 cps test signal to obtain a 5V rms output between pins A9P1-S1 and A9P1-T1.

4. Measure the input voltage between pins A9P1-B5 and A9P1-B4.

5. Calculate the difference between the voltages recorded in B.2.b and B.4.

6. Adjust the 800 cps signal for 0.10V rms between pins A9P1-B5 and A9P1-B4.

7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

STEP	HIGH	LOW
a	A9P1-M1	A9P1-L1
b	A9J1-24	A9J1-17

8. Disconnect pin A9P1-A6 from pin A9P1-B6.

9. Apply an 800 cps modulated test signal source between A9P1-A6 and A9P1-B6.

10. Adjust the 800 cps test signal from pins A9P1-B5 and A9P1-B4 to obtain a null at pins A9P1-S1 and A9P1-T1 with the modulated test signal set at zero volts.

11. Adjust the 800 cps modulated test signal to obtain a 35V pp output between A9P1-S1 and A9P1-T1.

12. Measure the signal between pins A9P1-A6 and A9P1-B6.

13. Remove the 800 cps test signal from pins A9P1-B5 and A9P1-B4.

14. Connect pins A9P1-B5 and A9P1-B4.

15. Remove the 800 cps modulated test signal from pins A9P1-A6 and A9P1-B6.

16. Apply a 0.10V rms, 800 cps test signal between pins A9P1-A6 and A9P1-B6.

17. Measure the output between the pins specified in Table III.

TABLE III

TEST PINS

STEP	HIGH	LOW
a	A9P1-M2	A9P1-L2
b	A8J1-10	A8J1-11

DATE ________

JOB: OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

TDRR 169

2 1965

JDC: 11291 **REV:** A **PAGE** 3 **OF** 3

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

18. Remove the 800 cps test signal from pins A9P1-A6 and A9P1-B6.

19. Connect pins A9P1-A6 and A9P1-B6.

20. Disconnect pin A9P1-C5 from pin A9P1-C6.

21. Apply an 800 cps test signal between pins A9P1-C5 and A9P1-C6.

22. Adjust the 800 cps test signal to 9V rms between pins A9P1-C5 and A9P1-C6.

23. Record the output between pins A9P1-S1 and A9P1-T1.

C. RECORD

Use Data Sheet 11291 to record:

1. Voltage
2. Phase

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

TDRR 16920

2 1965

JDC NO. 11291
REV. A
INITIAL TDRR ________

JOB OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ________ **DWG.** ________ **REV.** ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GRC AND SUPPORT EQUIPMENT

NAME ________ **SER. NO.** ________ CAL DATE ________

NAME ________ **SER. NO.** ________ CAL DATE ________

CONDUCTED BY ________ NAME / AFFILIATION **APPROVED by** ________ NAME / AFFILIATION

JDC STEP	PINS		VOLTAGE RMS			PHASE WITH RESPECT TO INPUT		
	High	Low	Minimum	Maximum	Actual	Minimum	Maximum	Actual
B.2.a	A9P1-S1	A9P1-T1				-18°	+18°	
B.2.b	A9P1-B5	A9P1-B4	(Record)	(Record)		-	-	
B.4	A9P1-B5	A9P1-B4	(Record)	(Record)		-	-	
B.5	A9P1-B5	A9P1-B4	0.0028	0.0065		-	-	
B.7.a	A9P1-M1	A9P1-L1	0.089	0.109		-10°	+10°	
B.7.b	A9J1-24	A9J1-17	0.089	0.109		-	-	
B.12	A9P1-A6	A9P1-B6	0.10*	0.30*		-	-	
B.17.a	A9P1-M2	A9P1-L2	0.089	0.109		-10°	+10°	
B.17.b	A9J1-10	A9J1-11	0.089	0.109		-	-	
B.23	A9P1-S1	A9P1-T1	30.0	-		-35°	+35°	

*Volts Peak to Peak

DATE ________

- Released with ATP1007570

TDRR 16920

MAR 2 1965

JOB: OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

JDC: 11291 **REV:** B **PAGE** 1 **OF** 3

INITIAL TDRR: ____ **DS. PGS.** 1

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine amplifier output.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-10-65	21499		1	WK	WM
B	12/21/65	24784		1	WK	TM

REFERENCES:

IMPORTANT:
Return all connections to original conditions upon conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply a 27.5±0.1 vdc source between pins A10P1-T4 and A10P1-P4.
2. Disconnect A9P1-B5 from A9P1-B4.
3. Apply an 800 cps test signal between A9P1-B5 and A9P1-B4.

B. PROCEDURE

1. Adjust the 800 cps signal to obtain a 12V rms output between pins A9P1-S1 and A9P1-T1.

   NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A9P1-S1 and A9P1-T1 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A9P1-S1 and A9P1-T1 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between the pins specified in Table I.

TABLE I
TEST PINS

STEP	HIGH	LOW
a	A9P1-S1	A9P1-T1
b	A9P1-B5	A9P1-B4

DATE ____

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JOB: OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

JDC: 11291 **REV:** B **PAGE** 2 **OF** 3

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

3. Adjust the 800 cps test signal to obtain a 5V rms output between pins A9P1-S1 and A9P1-T1.

4. Measure the input voltage between pins A9P1-B5 and A9P1-B4.

5. Calculate the difference between the voltages recorded in B.2.b and B.4.

6. Adjust the 800 cps signal for 0.10V rms between pins A9P1-B5 and A9P1-B4.

7. Measure the output between the pins specified in Table II.

TABLE II
TEST PINS

STEP	HIGH	LOW
a	A9P1-M1	A9P1-L1
b	A9J1-24	A9J1-17

8. Disconnect pin A9P1-A6 from pin A9P1-B6.

9. Apply an 800 cps modulated test signal source between A9P1-A6 and A9P1-B6.

10. Adjust the 800 cps test signal from pins A9P1-B5 and A9P1-B4 to obtain a null at pins A9P1-S1 and A9P1-T1 with the modulated test signal set at zero volts.

11. Adjust the 800 cps modulated test signal to obtain a 35V pp output between A9P1-S1 and A9P1-T1.

12. Measure the signal between pins A9P1-A6 and A9P1-B6.

13. Remove the 800 cps test signal from pins A9P1-B5 and A9P1-B4.

14. Connect pins A9P1-B5 and A9P1-B4.

15. Remove the 800 cps modulated test signal from pins A9P1-A6 and A9P1-B6.

16. Apply a 0.10V rms, 800 cps test signal between pins A9P1-A6 and A9P1-B6.

17. Measure the output between the pins specified in Table III.

TABLE III
TEST PINS

STEP	HIGH	LOW
a	A9P1-M2	A9P1-L2
b	A8J1-10	A8J1-11

DATE ____

TDRR 169 0

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JOB: OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

JDC: 11291 **REV:** B **PAGE** 3 **OF** 3

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

18. Remove the 800 cps test signal from pins A9P1-A6 and A9P1-B6.

19. Connect pins A9P1-A6 and A9P1-B6.

20. Disconnect pin A9P1-C5 from pin A9P1-C6.

21. Apply an 800 cps test signal between pins A9P1-C5 and A9P1-C6.

22. Adjust the 800 cps test signal to 9V rms between pins A9P1-C5 and A9P1-C6.

23. Record the output between pins A9P1-S1 and A9P1-T1.

C. RECORD

Use Data Sheet 11291 to record:

1. Voltage
2. Phase

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

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JDC NO. 11291
REV. B
INITIAL TDRR ____

JOB OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ **DWG.** ____ **REV.** ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ **SER. NO.** ____ CAL. DATE

NAME ____ **SER. NO.** ____ CAL. DATE

CONDUCTED BY ____ NAME / AFFILIATION **APPROVED BY** ____ NAME / AFFILIATION

JDC STEP	PINS		VOLTAGE RMS			PHASE WITH RESPECT TO INPUT		
	High	Low	Minimum	Maximum	Actual	Minimum	Maximum	Actual
B.2.a	A9P1-S1	A9P1-T1				-18°	+18°	
B.2.b	A9P1-B5	A9P1-B4	(Record)	(Record)		-	-	
B.4	A9P1-B5	A9P1-B4	(Record)	(Record)		-	-	
B.5	A9P1-B5	A9P1-B4	0.0034	0.0078		-	-	
B.7.a	A9P1-M1	A9P1-L1	0.089	0.109		-10°	+10°	
B.7.b	A9J1-24	A9J1-17	0.089	0.109		-	-	
B.12	A9P1-A6	A9P1-B6	0.12*	0.39*		-	-	
B.17.a	A9P1-M2	A9P1-L2	0.089	0.109		-10°	+10°	
B.17.b	A9J1-10	A9J1-11	0.089	0.109		-	-	
B.23	A9P1-S1	A9P1-T1	30.0	-		-35°	+35°	

*Volts Peak to Peak

DATE ____

-- Released with ATP1007870

TDRR 16920

MAR 2 1965

JOB: OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

JDC: 11291 **REV:** C **PAGE** 1 **OF** 3

INITIAL TDRR: **D.S. PGS.** 1

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine amplifier output.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL AC	APPROVAL NASA
A	8-10-65	21499		1	WK	WM
B	12/21/65	24784		1	WK	TM
C	6/8/67	33955		1	MGM EA	--

REFERENCES:

IMPORTANT: Return all connections to original conditions upon conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply a 27.5±0.1 vdc source between pins A10P1-T4 and A10P1-P4.
2. Disconnect A9P1-B5 from A9P1-B4.
3. Apply an 800 cps, test signal between A9P1-B5 and A9P1-B4.

B. PROCEDURE

1. Adjust the 800 cps signal to obtain a 12V rms output between pins A9P1-S1 and A9P1-T1.

   NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A9P1-S1 and A9P1-T1 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A9P1-S1 and A9P1-T1 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between the pins specified in Table I.

TABLE I

TEST PINS

STEP	HIGH	LOW
a	A9P1-S1	A9P1-T1
b	A9P1-B5	A9P1-B4

DATE ______

JOB: OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

TDRR 1692

MAR 2 1965

JDC: 11291 **REV:** C **PAGE** 2 **OF** 3

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

3. Adjust the 800 cps test signal to obtain a 5V rms output between pins A9P1-S1 and A9P1-T1.

4. Measure the input voltage between pins A9P1-B5 and A9P1-B4.

5. Calculate the difference between the voltages recorded in B.2.b and B.4.

6. Adjust the 800 cps signal for 0.10V rms between pins A9P1-B5 and A9P1-B4.

7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

STEP	HIGH	LOW
a	A9P1-M1	A9P1-L1
b	A9J1-24	A9J1-17

8. Disconnect pin A9P1-A6 from pin A9P1-B6.

9. Apply an 800 cps modulated test signal source between A9P1-A6 and A9P1-B6.

10. Adjust the 800 cps test signal from pins A9P1-B5 and A9P1-B4 to obtain a null at pins A9P1-S1 and A9P1-T1. ~~with the modulated test signal set at zero volts.~~

11. Adjust the 800 cps modulated test signal to obtain a 35V pp output between A9P1-S1 and A9P1-T1.

12. Measure the signal between pins A9P1-A6 and A9P1-B6.

13. Remove the 800 cps test signal from pins A9P1-B5 and A9P1-B4.

14. Connect pins A9P1-B5 and A9P1-B4.

15. Remove the 800 cps modulated test signal from pins A9P1-A6 and A9P1-B6.

16. Apply a 0.10V rms, 800 cps test signal between pins A9P1-A6 and A9P1-B6.

17. Measure the output between the pins specified in Table III.

TABLE III

TEST PINS

STEP	HIGH	LOW
a	A9P1-M2	A9P1-L2
b	A8J1-10	A8J1-11

DATE ______

JOB: OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

TDRR 169:0

MAR 2 1965

JDC: 11291 **REV:** C **PAGE** 3 **OF** 3

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

18. Remove the 800 cps test signal from pins A9P1-A6 and A9P1-B6.

19. Connect pins A9P1-A6 and A9P1-B6.

20. Disconnect pin A9P1-C5 from pin A9P1-C6.

21. Apply an 800 cps test signal between pins A9P1-C5 and A9P1-C6.

22. Adjust the 800 cps test signal to 9V rms between pins A9P1-C5 and A9P1-C6.

23. Record the output between pins A9P1-S1 and A9P1-T1.

C. RECORD

Use Data Sheet 11291 to record:

1. Voltage
2. Phase

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

TDRR 16920

MAR. 2 1965

JDC NO. 11291
REV. C
INITIAL TDRR ______

JOB OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ **DWG.** ______ **REV.** ___

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ **SER. NO.** ______ CAL DATE ______

NAME ______ **SER. NO.** ______ CAL DATE ______

CONDUCTED BY ______ NAME / APPLICATION **APPROVED BY** ______ NAME / APPLICATION

JDC STEP	PINS		VOLTAGE RMS			PHASE WITH RESPECT TO INPUT		
	High	Low	Minimum	Maximum	Actual	Minimum	Maximum	Actual
B.2.a	A9P1-S1	A9P1-T1				-18°	+18°	
B.2.b	A9P1-B5	A9P1-B4	(Record)	(Record)		-	-	
B.4	A9P1-B5	A9P1-B4	(Record)	(Record)		-	-	
B.5	A9P1-B5	A9P1-B4	0.0034	0.0078		-	-	
B.7.a	A9P1-M1	A9P1-L1	0.089	0.109		-10°	+10°	
B.7.b	A9J1-24	A9J1-17	0.089	0.109		-	-	
B.12	A9P1-A6	A9P1-B6	0.12*	0.39*		-	-	
B.17.a	A9P1-M2	A9P1-L2	0.089	0.109		-10°	+10°	
B.17.b	A9J1-10	A9J1-11	0.089	0.109		-	-	
B.23	A9P1-S1	A9P1-T1	27.0	-		-35°	+35°	

*Volts Peak to Peak

DATE ______

-- Released with ATP1007570

TDRR 16920

MAR 2 1965

JOB: OPTICS TRUNNION AXIS
CDU MOTOR DRIVE TEST

JDC: 11291 **REV:** – **PAGE** 1 **OF** 3
INITIAL TDRR: **D.S. PGS:** 1

SUBSYSTEM: POWER AND SERVO ASSEMBLY
ASSY:

DESCRIPTION:

Test to determine amplifier output.

Rev. Let	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES:

IMPORTANT:
Return all connections to original conditions upon conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply a 27.5±0.1 vdc source between pins A10P1-T4 and A10P1-P4.
2. Disconnect A9P1-B5 from A9P1-B4.
3. Apply an 800 cps, test signal between A9P1-B5 and A9P1-B4.

B. PROCEDURE

1. Adjust the 800 cps signal to obtain a 12V rms output between pins A9P1-S1 and A9P1-T1.

   NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A9P1-S1 and A9P1-T1 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A9P1-S1 and A9P1-T1 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between the pins specified in Table I.

TABLE I
TEST PINS

STEP	HIGH	LOW
a	A9P1-S1	A9P1-T1
b	A9P1-B5	A9P1-B4

DATE ________

JOB: OPTICS TRUNNION AXIS
CDU MOTOR DRIVE TEST

TDRR 1692

JDC: 11291 MAR 2 1965 **REV:** – **PAGE** 2 **OF** 3

SUBSYSTEM: POWER AND SERVO ASSEMBLY
ASSY:

3. Adjust the 800 cps test signal to obtain a 5V rms output between pins A9P1-S1 and A9P1-T1.
4. Measure the input voltage between pins A9P1-B5 and A9P1-B4.
5. Calculate the difference between the voltages recorded in B.2.b and B.4.
6. Adjust the 800 cps, signal for 0.10V rms between pins A9P1-B5 and A9P1-B4.
7. Measure the output between the pins specified in Table II.

TABLE II
TEST PINS

STEP	HIGH	LOW
a	A9P1-M1	A9P1-L1
b	A9J1-24	A9J1-17

8. Disconnect pin A9P1-A6 from pin A9P1-B6.
9. Apply an 800 cps modulated test signal source between A9P1-A6 and A9P1-B6.
10. Adjust the 800 cps test signal from pins A9P1-B5 and A9P1-B4 to obtain a null at pins A9P1-S1 and A9P1-T1, ~~with the modulated test signal set at zero volts~~.
11. Adjust the 800 cps modulated test signal to obtain a 35V pp output between A9P1-S1 and A9P1-T1.
12. Measure the signal between pins A9P1-A6 and A9P1-B6.
13. Remove the 800 cps test signal from pins A9P1-B5 and A9P1-B4.
14. Connect pins A9P1-B5 and A9P1-B4.
15. Remove the 800 cps modulated test signal from pins A9P1-A6 and A9P1-B6.
16. Apply a 0.10V rms, 800 cps test signal between pins A9P1-A6 and A9P1-B6.
17. Measure the output between the pins specified in Table III.

TABLE III
TEST PINS

STEP	HIGH	LOW
a	A9P1-M2	A9P1-L2
b	A8J1-10	A8J1-11

DATE ________

JOB: OPTICS TRUNNION AXIS
CDU MOTOR DRIVE TEST

TDRR 169

MAR 2 1965

JDC: 11291 **REV:** – **PAGE** 3 **OF** 3

SUBSYSTEM: POWER AND SERVO ASSEMBLY
ASSY:

18. Remove the 800 cps test signal from pins A9P1-A6 and A9P1-B6.
19. Connect pins A9P1-A6 and A9P1-B6.
20. Disconnect pin A9P1-C5 from pin A9P1-C6.
21. Apply an 800 cps test signal between pins A9P1-C5 and A9P1-C6.
22. Adjust the 800 cps test signal to 9V rms between pins A9P1-C5 and A9P1-C6.
23. Record the output between pins A9P1-S1 and A9P1-T1.

C. RECORD

Use Data Sheet 11291 to record:

1. Voltage
2. Phase

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

TDRR 16920

MAR 2 1965

NO. 11291 **JDC**
REV. –
INITIAL TDRR

JOB OPTICS TRUNNION AXIS CDU MOTOR DRIVE TEST

ASSEMBLY UNDER TEST

TITLE ________
SER. NO. ________ **DWG.** ________ **REV.** ________

TEST HISTORY

DATE ________ START ________ END ________ SITE/LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ **SER. NO.** ________ CAL DATE
NAME ________ **SER. NO.** ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION **APPROVED BY** ________ NAME/AFFILIATION

JDC STEP	PINS High	PINS Low	VOLTAGE RMS Minimum	VOLTAGE RMS Maximum	VOLTAGE RMS Actual	PHASE WITH RESPECT TO INPUT Minimum	PHASE WITH RESPECT TO INPUT Maximum	PHASE WITH RESPECT TO INPUT Actual
B.2.a	A9P1-S1	A9P1-T1				-18°	+18°	
B.2.b	A9P1-B5	A9P1-B4	(Record)	(Record)		-	-	
B.4	A9P1-B5	A9P1-B4	(Record)	(Record)		-	-	
B.5	A9P1-B5	A9P1-B4	0.0028	0.0065		-	-	
B.7.a	A9P1-M1	A9P1-L1	0.089	0.109		-10°	+10°	
B.7.b	A9J1-24	A9J1-17	0.089	0.109		-	-	
B.12	A9P1-A6	A9P1-B6	0.25*	0.75*		-	-	
B.17.a	A9P1-M2	A9P1-L2	0.089	0.109		-10°	+10°	
B.17.b	A9J1-10	A9J1-11	0.089	0.109		-	-	
B.23	A9P1-S1	A9P1-T1	30.0	-		-35°	+35°	

*Volts Peak to Peak

DATE ________

released with ATP1007570 TDRR 16920 MAR 2 1965

JDC: 11294 REV: A PAGE 1 OF 4

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

INITIAL TDRR: ______ **DS. PGS.** 1

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine output voltage of shaft motor drive amplifier.

Rev. Let	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	4/27/65	18653		1	W.K.	W.J.R.

REFERENCES:

IMPORTANT: Return all connections to original conditions at the conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply 27.5±0.1 vdc to pins A10P1-T5 and A10P1-P4.
2. Remove the connection from pins A8P1-A7 and A8P1-B7.
3. Connect an 800 cps test signal to pins A8P1-A7 and A8P1-B7.

B. PROCEDURE

1. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.

   NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S5 and A8P1-T5 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A8P1-S5 and A8P1-T5 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between pins specified in Table I.

TABLE I

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A8J1-27	A8J1-28
c	A8P1-A7	A8P1-B7

DATE ______

TDRR 16920 MAR 2 1965

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 **REV:** A **PAGE** 2 **OF** 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

3. Adjust the 800 cps test signal to obtain 5V rms output between pins A8P1-S5 and A8P1-T5.
4. Measure the input voltage between pins A8P1-A7 and A8P1-B7.
5. Calculate the difference between the voltages recorded in Steps B.2.c and B.4.
6. Adjust the 800 cps test signal for 0.10V rms between pins A8P1-A7 and A8P1-B7.
7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

STEP	HIGH	LOW
a	A8P1-M4	A8P1-L4
b	A8J1-17	A8J1-24

8. Remove the 800 cps test signal from pins A8P1-A7 and A8P1-B7.
9. Connect pins A8P1-A7 and A8P1-B7.
10. Remove the connection from pins A9P1-D8 and A9P1-D7.
11. Connect an 800 cps test signal to pins A9P1-D8 and A9P1-D7.
12. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.

    NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S5 and A8P1-T5 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A8P1-S5 and A8P1-T5 passes through the null, reverses phase and increases to 12V rms.

13. Measure the signal between the pins specified in Table III.

TABLE III

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A9P1-D8	A9P1-D7

DATE ______

TDRR 16920 1965

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 **REV:** A **PAGE** 3 **OF** 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

14. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S5 and A8P1-T5.
15. Measure the input voltage between pins A9P1-D8 and A9P1-D7.
16. Calculate the difference between the voltages recorded in steps B.13.b and B.15.
17. Adjust the 800 cps test signal to 0.10V rms.
18. Measure the output between the pins specified in Table IV.

TABLE IV

TEST PINS

STEP	HIGH	LOW
a	A8P1-M3	A8P1-L3
b	A8J1-9	A8J1-23

19. Remove the 800 cps test signal from pins A9P1-D8 and A9P1-D7.
20. Connect pins A9P1-D8 and A9P1-D7.
21. Remove the connection from pins A8P1-B1 to pin A9P1-A1.
22. Apply an 800 cps test signal across pins A8P1-B1 and A8P1-A1.
23. Connect pin A8P1-P1 to pin A8P1-R5.
24. Adjust the 800 cps test signal for 9V rms between pins A8P1-B1 and A8P1-A1.
25. Measure the output between pins A8P1-S5 and A8P1-T5.
26. Remove the 800 cps test signal from pins A8P1-B1 and A8P1-A1.
27. Connect pins A8P1-B1 and A8P1-A1.
28. Disconnect pin A8P1-A3 from pin A8P1-A2.
29. Apply an 800 cps test signal between pins A8P1-A3 and A8P1-A2.

DATE ______

TDRR

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 **REV:** A **PAGE** 4 **OF** 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

30. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.
31. Measure the output between the pins specified in Table V.

TABLE V

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A8P1-A3	A8P1-A2

32. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S5 and A8P1-T5.
33. Measure the input voltage between pins A8P1-A3 and A8P1-A2.
34. Calculate the difference between the voltages recorded in steps B.31.b and B.33.
35. Disconnect pin A8P1-A7 from pin A8P1-B7.
36. Connect an 800 cps modulated test signal source between pins A8P1-A7 and A8P1-B7.
37. Adjust the 800 cps test signal from pins A8P1-A3 and A8P1-A2, to obtain a null at pins A8P1-S5 and A8P1-T5 with the modulated signal set at zero volts.
38. Adjust the 800 cps modulated signal to obtain a 35V pp output between pins A8P1-S5 and A8P1-T5.
39. Measure the input voltage between pins A8P1-A7 and A8P1-B7.

C. RECORD

Use Data Sheet 11294 to record:

1. Voltage
2. Phase

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 11:94
REV. A
INITIAL TDRR

JOB SEXTANT SHAFT MOTOR DRIVE TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG. ______ REV. ___

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL. DATE

NAME ______ SER. NO. ______ CAL. DATE

CONDUCTED BY ______ NAME / AFFILIATION APPROVED BY ______ NAME / AFFILIATION

JDC STEP	PINS		VOLTAGE (Vac rms)			PHASE **		
	HIGH	LOW	Minimum	Maximum	Actual	Minimum	Maximum	Actual
B.2.a	A8P1-S5	A8P1-T5	-	-	-	162°	198°	
B.2.b	A8J1-27	A8J1-28	5.0	7.0		-	-	-
B.2.c	A8P1-A7	A8P1-B7	(Record)	(Record)		-	-	-
B.4	A8P1-A7	A8P1-B7	(Record)	(Record)		-	-	-
B.5	A8P1-A7	A8P1-B7	0.0029	0.0064		-	-	-
B.7.a	A8P1-M4	A8P1-L4	0.089	0.109		-10°	+10°	
B.7.b	A8J1-19	A8J1-24	0.089	0.109		-	-	-
B.13.a	A8P1-S5	A8P1-T5	-	-	-	162°	198°	
B.13.b	A9P1-D6	A9P1-D7	(Record)	(Record)		-	-	-
B.15	A9P1-D6	A9P1-D7	(Record)	(Record)		-	-	-
B.16	A9P1-D6	A9P1-D7	0.0028	0.0065		-	-	-
B.18.a	A8P1-M3	A8P1-L3	0.089	0.109		-10°	+10°	
B.18.b	A8J1-9	A8J1-23	0.089	0.109		-	-	-
B.25	A8P1-S5	A8P1-T5	30	-		145°	215°	
B.31.a	A8P1-S5	A8P1-T5	-	-		162°	198°	
B.31.b	A8P1-A3	A8P1-A2	(Record)	(Record)		-	-	-
B.33	A8P1-A3	A8P1-A2	(Record)	(Record)		-	-	-
B.34	A8P1-A3	A8P1-A2	0.0029	0.0066		-	-	-
B.39	A8P1-A7	A8P1-B7	0.25*	0.55*		-	-	-

*Volts peak to peak
** With respect to input

DATE ______

released with ATP1007570 TDRR 16920 MAR 2 1965

JDC: 11294 REV: B PAGE 1 OF 4

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

INITIAL TDRR: ________ DS. PGS. 1

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine output voltage of shaft motor drive amplifier.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	4/27/65	18653		1	W.K.	W.J.R
B	8-10-65	21505		1	WK	WM

REFERENCES:

IMPORTANT: Return all connections to original conditions at the conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply 27.5±0.1 vdc to pins A10P1-T5 and A10P1-P4.
2. Remove the connection from pins A8P1-A7 and A8P1-B7.
3. Connect an 800 cps test signal to pins A8P1-A7 and A8P1-B7.

B. PROCEDURE

1. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.

   NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S5 and A8P1-T5 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A8P1-S5 and A8P1-T5 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between pins specified in Table I.

TABLE I

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A8J1-27	A8J1-28
c	A8P1-A7	A8P1-B7

DATE ________

TDRR 16920 MAR 2 1965

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 **REV:** B **PAGE** 2 **OF** 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

3. Adjust the 800 cps test signal to obtain 5V rms output between pins A8P1-S5 and A8P1-T5.

4. Measure the input voltage between pins A8P1-A7 and A8P1-B7.

5. Calculate the difference between the voltages recorded in Steps B.2.c and B.4.

6. Adjust the 800 cps test signal for 0.10V rms between pins A8P1-A7 and A8P1-B7.

7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

STEP	HIGH	LOW
a	A8P1-M4	A8P1-L4
b	A8J1-17	A8J1-24

8. Remove the 800 cps test signal from pins A8P1-A7 and A8P1-B7.

9. Connect pins A8P1-A7 and A8P1-B7.

10. Remove the connection from pins A9P1-D8 and A9P1-D7.

11. Connect an 800 cps test signal to pins A9P1-D8 and A9P1-D7.

12. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.

    NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S5 and A8P1-T5 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A8P1-S5 and A8P1-T5 passes through the null, reverses phase and increases to 12V rms.

13. Measure the signal between the pins specified in Table III.

TABLE III

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A9P1-D8	A9P1-D7

DATE ________

TDRR 16920

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 **REV:** B **PAGE** 3 **OF** 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

14. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S5 and A8P1-T5.

15. Measure the input voltage between pins A9P1-D8 and A9P1-D7.

16. Calculate the difference between the voltages recorded in steps B.13.b and B.15.

17. Adjust the 800 cps test signal to 0.10V rms.

18. Measure the output between the pins specified in Table IV.

TABLE IV

TEST PINS

STEP	HIGH	LOW
a	A8P1-M3	A8P1-L3
b	A8J1-9	A8J1-23

19. Remove the 800 cps test signal from pins A9P1-D8 and A9P1-D7.

20. Connect pins A9P1-D8 and A9P1-D7.

21. Remove the connection from pins A8P1-B1 to pin A9P1-A1.

22. Apply an 800 cps test signal across pins A8P1-B1 and A8P1-A1.

23. Connect pin A8P1-P1 to pin A8P1-R5.

24. Adjust the 800 cps test signal for 9V rms between pins A8P1-B1 and A8P1-A1.

25. Measure the output between pins A8P1-S5 and A8P1-T5.

26. Remove the 800 cps test signal from pins A8P1-B1 and A8P1-A1.

27. Connect pins A8P1-B1 and A8P1-A1.

28. Disconnect pin A8P1-A3 from pin A8P1-A2.

29. Apply an 800 cps test signal between pins A8P1-A3 and A8P1-A2.

DATE ________

TDRR

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 **REV:** B **PAGE** 4 **OF** 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

30. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.

31. Measure the output between the pins specified in Table V.

TABLE V

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A8P1-A3	A8P1-A2

32. Adjust the 800 cps test signal to obtain a 5V rms ouqput between pins A8P1-S5 and A8P1-T5.

33. Measure the input voltage between pins A8P1-A3 and A8P1-A2.

34. Calculate the difference between the voltages recorded in steps B.31.b and B.33.

35. Disconnect pin A8P1-A7 from pin A8P1-B7.

36. Connect an 800 cps modulated test signal source between pins A8P1-A7 and A8P1-B7.

37. Adjust the 800 cps test signal from pins A8P1-A3 and A8P1-A2, to obtain a null at pins A8P1-S5 and A8P1-T5 with the modulated signal set at zero volts.

38. Adjust the 800 cps modulated signal to obtain a 35V pp output between pins A8P1-S5 and A8P1-T5.

39. Measure the input voltage between pins A8P1-A7 and A8P1-B7.

C. RECORD

Use Data Sheet 11294 to record:

1. Voltage
2. Phase

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

TDR

NO. 11294 JDC
REV. B
INITIAL TDRF ______

JOB SEXTANT SHAFT MOTOR DRIVE TEST

ASSEMBLY UNDER TEST

TITLE ____________________

SER. NO. ______ DWG. ______ REV. ___

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________________ SER. NO. ______ CAL. DATE ______

NAME ____________________ SER. NO. ______ CAL. DATE ______

CONDUCTED BY ______ NAME /AFFILIATION APPROVED BY ______ NAME / AFFILIATION

JDC STEP	PINS		VOLTAGE (Vac rms)			PHASE **		
	HIGH	LOW	Minimum	Maximum	Actual	Minimum	Maximum	Actual
B.2.a	A8P1-S5	A8P1-T5	-	-	-	162°	198°	
B.2.b	A8J1-27	A8J1-28	5.0	7.0		-	-	-
B.2.c	A8P1-A7	A8P1-B7	(Record)	(Record)		-	-	-
B.4	A8P1-A7	A8P1-B7	(Record)	(Record)		-	-	-
B.5	A8P1-A7	A8P1-B7	0.0029	0.0054		-	-	-
B.7.a	A8P1-M4	A8P1-L4	0.089	0.109		-10°	+10°	
B.7.b	A8J1-17	A8J1-24	0.089	0.109		-	-	-
B.13.a	A8P1-S5	A8P1-T5	-	-	-	162°	198°	
B.13.b	A9P1-D6	A9P1-D7	(Record)	(Record)		-	-	-
B.15	A9P1-D6	A9P1-D7	(Record)	(Record)		-	-	-
B.16	A9P1-D6	A9P1-D7	0.0035	0.0065		-	-	-
B.18.a	A8P1-M3	A8P1-L3	0.089	0.109		-10°	+10°	
B.18.b	A8J1-9	A8J1-23	0.089	0.109		-	-	-
B.25	A8P1-S5	A8P1-T5	30	-		145°	215°	
B.31.a	A8P1-S5	A8P1-T5	-	-		162°	198°	
B.31.b	A8P1-A3	A8P1-A2	(Record)	(Record)		-	-	-
B.33	A8P1-A3	A8P1-A2	(Record)	(Record)		-	-	-
B.34	A8P1-A3	A8P1-A2	0.0037	0.0066		-	-	-
B.39	A8P1-A7	A8P1-B7	0.25*	0.75*		-	-	-

*Volts peak to peak
** With respect to input

DATE ______

released with ATP1007570 TDRR 16920 MAR 2 1965

JDC: 11294 REV: C PAGE 1 OF 4

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

INITIAL TDRR: ______ IS PGS. 1

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine output voltage of shaft motor drive amplifier.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL AC	APPROVAL NASA
A	4/27/65	18653		1	W.K.	W.J.R
B	8-10-65	21505		1	WK	WM
C	6-8-67	33955		1	MGM EA	--

REFERENCES:

IMPORTANT: Return all connections to original conditions at the conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply 27.5±0.1 vdc to pins A10P1-T5 and A10P1-P4.
2. Remove the connection from pins A8P1-A7 and A8P1-B7.
3. Connect an 800 cps test signal to pins A8P1-A7 and A8P1-B7.

B. PROCEDURE

1. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.

   NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S5 and A8P1-T5 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A8P1-S5 and A8P1-T5 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between pins specified in Table I.

TABLE I

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A8J1-27	A8J1-28
c	A8P1-A7	A8P1-B7

DATE ______

TDRR 16920 MAR 2 1965

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 REV: C PAGE 2 OF 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

3. Adjust the 800 cps test signal to obtain 5V rms output between pins A8P1-S5 and A8P1-T5.
4. Measure the input voltage between pins A8P1-A7 and A8P1-B7.
5. Calculate the difference between the voltages recorded in Steps B.2.c and B.4.
6. Adjust the 800 cps test signal for 0.10V rms between pins A8P1-A7 and A8P1-B7.
7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

STEP	HIGH	LOW
a	A8P1-M4	A8P1-L4
b	A8J1-17	A8J1-24

8. Remove the 800 cps test signal from pins A8P1-A7 and A8P1-B7.
9. Connect pins A8P1-A7 and A8P1-B7.
10. Remove the connection from pins A9P1-D8 and A9P1-D7.
11. Connect an 800 cps test signal to pins A9P1-D8 and A9P1-D7.
12. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.

    NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S5 and A8P1-T5 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A8P1-S5 and A8P1-T5 passes through the null, reverses phase and increases to 12V rms.

13. Measure the signal between the pins specified in Table III.

TABLE III

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A9P1-D8	A9P1-D7

DATE ______

TDRR 16920 MAR 2 1965

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 REV: C PAGE 3 OF 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

14. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S5 and A8P1-T5.
15. Measure the input voltage between pins A9P1-D8 and A9P1-D7.
16. Calculate the difference between the voltages recorded in steps B.13.b and B.15.
17. Adjust the 800 cps test signal to 0.10V rms.
18. Measure the output between the pins specified in Table IV.

TABLE IV

TEST PINS

STEP	HIGH	LOW
a	A8P1-M3	A8P1-L3
b	A8J1-9	A8J1-23

19. Remove the 800 cps test signal from pins A9P1-D8 and A9P1-D7.
20. Connect pins A9P1-D8 and A9P1-D7.
21. Remove the connection from pins A8P1-B1 to pin A9P1-A1.
22. Apply an 800 cps test signal across pins A8P1-B1 and A8P1-A1.
23. Connect pin A8P1-P1 to pin A8P1-R5.
24. Adjust the 800 cps test signal for 9V rms between pins A8P1-B1 and A8P1-A1.
25. Measure the output between pins A8P1-S5 and A8P1-T5.
26. Remove the 800 cps test signal from pins A8P1-B1 and A8P1-A1.
27. Connect pins A8P1-B1 and A8P1-A1.
28. Disconnect pin A8P1-A3 from pin A8P1-A2.
29. Apply an 800 cps test signal between pins A8P1-A3 and A8P1-A2.

DATE ______

TDRR 16920 2 1965

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 REV: C PAGE 4 OF 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

30. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.
31. Measure the output between the pins specified in Table V.

TABLE V

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A8P1-A3	A8P1-A2

32. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S5 and A8P1-T5.
33. Measure the input voltage between pins A8P1-A3 and A8P1-A2.
34. Calculate the difference between the voltages recorded in steps B.31.b and B.33.
35. Disconnect pin A8P1-A7 from pin A8P1-B7.
36. Connect an 800 cps modulated test signal source between pins A8P1-A7 and A8P1-B7.
37. Adjust the 800 cps test signal from pins A8P1-A3 and A8P1-A2, to obtain a null at pins A8P1-S5 and A8P1-T5 with the modulated signal set at zero volts.
38. Adjust the 800 cps modulated signal to obtain a 35V pp output between pins A8P1-S5 and A8P1-T5.
39. Measure the input voltage between pins A8P1-A7 and A8P1-B7.

C. RECORD

Use Data Sheet 11294 to record:

1. Voltage
2. Phase

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

TDRR 16820 MAR 2 1965

NO. 11294 JDC
REV. C
INITIAL TDRR ____

JOB SEXTANT SHAFT MOTOR DRIVE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG. ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ C.L. DATE
NAME ____ SER. NO. ____ C.L. DATE

CONDUCTED BY ____ NAME /AFFILIATION APPROVED BY ____ NAME / AFFILIATION

JDC STEP	PINS		VOLTAGE (Vac rms)			PHASE **		
	HIGH	LOW	Minimum	Maximum	Actual	Minimum	Maximum	Actual
B.2.a	A8P1-S5	A8P1-T5	-	-	-	162°	198°	
B.2.b	A8J1-27	A8J1-28	5.0	7.0		-	-	-
B.2.c	A8P1-A7	A8P1-B7	(Record)	(Record)		-	-	-
B.4	A8P1-A7	A8P1-B7	(Record)	(Record)		-	-	-
B.5	A8P1-A7	A8P1-B7	0.0029	0.0054		-	-	-
B.7.a	A8P1-M4	A8P1-L4	0.089	0.109		-10°	+10°	
B.7.b	A8J1-19	A8J1-24	0.089	0.109		-	-	-
B.13.a	A8P1-S5	A8P1-T5	-	-	-	162°	198°	
B.13.b	A9P1-D8	A9P1-D7	(Record)	(Record)		-	-	-
B.15	A9P1-D8	A9P1-D7	(Record)	(Record)		-	-	-
B.16	A9P1-D8	A9P1-D7	0.0025	0.0066		-	-	-
B.18.a	A8P1-M3	A8P1-L3	0.089	0.109		-10°	+10°	
B.18.b	A8J1-9	A8J1-23	0.089	0.109		-	-	-
B.25	A8P1-S5	A8P1-T5	27	-		145°	215°	
B.31.a	A8P1-S5	A8P1-T5	-	-		162°	198°	
B.31.b	A8P1-A3	A8P1-A2	(Record)	(Record)		-	-	-
B.33	A8P1-A3	A8P1-A2	(Record)	(Record)		-	-	-
B.34	A8P1-A3	A8P1-A2	0.0035	0.0066		-	-	-
B.39	A8P1-A7	A8P1-B7	0.259*	0.559*		-	-	-

*Volts peak to peak
** With respect to input

DATE ____

released with ATP1007570 TDRR 16920 MAR 2 1965

JDC: 11294 REV: — PAGE 1 OF 4

INITIAL TDRR: D.S. PGS. 1

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

DESCRIPTION:

Test to determine output voltage of shaft motor drive amplifier.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES:

IMPORTANT: Return all connections to original conditions at the conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply 27.5±0.1 vdc to pins A10P1-T5 and A10P1-P4.
2. Remove the connection from pins A8P1-A7 and A8P1-B7.
3. Connect an 800 cps test signal to pins A8P1-A7 and A8P1-B7.

B. PROCEDURE

1. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.

NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S5 and A8P1-T5 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A8P1-S5 and A8P1-T5 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between pins specified in Table I.

TABLE I

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A8J1-27	A8J1-28
c	A8P1-A7	A8P1-B7

DATE ________

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JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 **REV:** — **PAGE** 2 **OF** 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

3. Adjust the 800 cps test signal to obtain 5V rms output between pins A8P1-S5 and A8P1-T5.

4. Measure the input voltage between pins A8P1-A7 and A8P1-B7.

5. Calculate the difference between the voltages recorded in Steps B.2.c and B.4.

6. Adjust the 800 cps test signal for 0.10V rms between pins A8P1-A7 and A8P1-B7.

7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

STEP	HIGH	LOW
a	A8P1-M4	A8P1-L4
b	A8J1-17	A8J1-24

8. Remove the 800 cps test signal from pins A8P1-A7 and A8P1-B7.

9. Connect pins A8P1-A7 and A8P1-B7.

10. Remove the connection from pins A9P1-D8 and A9P1-D7.

11. Connect an 800 cps test signal to pins A9P1-D8 and A9P1-D7.

12. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.

NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S5 and A8P1-T5 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between pins A8P1-S5 and A8P1-T5 passes through the null, reverses phase and increases to 12V rms.

13. Measure the signal between the pins specified in Table III.

TABLE III

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A9P1-D8	A9P1-D7

DATE ________

TDRR 16920 MAR 2 1965

JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 **REV:** — **PAGE** 3 **OF** 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

14. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S5 and A8P1-T5.

15. Measure the input voltage between pins A9P1-D8 and A9P1-D7.

16. Calculate the difference between the voltages recorded in steps B.13.b and B.15.

17. Adjust the 800 cps test signal to 0.10V rms.

18. Measure the output between the pins specified in Table IV.

TABLE IV

TEST PINS

STEP	HIGH	LOW
a	A8P1-M3	A8P1-L3
b	A8J1-9	A8J1-23

19. Remove the 800 cps test signal from pins A9P1-D8 and A9P1-D7.

20. Connect pins A9P1-D8 and A9P1-D7.

21. Remove the connection from pins A8P1-B1 to pin A9P1-A1.

22. Apply an 800 cps test signal across pins A8P1-B1 and A8P1-A1.

23. Connect pin A8P1-P1 to pin A8P1-R5.

24. Adjust the 800 cps test signal for 9V rms between pins A8P1-B1 and A8P1-A1.

25. Measure the output between pins A8P1-S5 and A8P1-T5.

26. Remove the 800 cps test signal from pins A8P1-B1 and A8P1-A1.

27. Connect pins A8P1-B1 and A8P1-A1.

28. Disconnect pin A8P1-A3 from pin A8P1-A2.

29. Apply an 800 cps test signal between pins A8P1-A3 and A8P1-A2.

DATE ________

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JOB: SEXTANT SHAFT MOTOR DRIVE TEST

JDC: 11294 **REV:** — **PAGE** 4 **OF** 4

SUBSYSTEM: POWER AND SERVO ASSEMBLY

ASSY:

30. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S5 and A8P1-T5.

31. Measure the output between the pins specified in Table V.

TABLE V

TEST PINS

STEP	HIGH	LOW
a	A8P1-S5	A8P1-T5
b	A8P1-A3	A8P1-A2

32. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S5 and A8P1-T5.

33. Measure the input voltage between pins A8P1-A3 and A8P1-A2.

34. Calculate the difference between the voltages recorded in steps B.31.b and B.33.

35. Disconnect pin A8P1-A7 from pin A8P1-B7.

36. Connect an 800 cps modulated test signal source between pins A8P1-A7 and A8P1-B7.

37. Adjust the 800 cps test signal from pins A8P1-A3 and A8P1-A2, to obtain a null at pins A8P1-S5 and A8P1-T5 with the modulated signal set at zero volts.

38. Adjust the 800 cps modulated signal to obtain a 35V pp output between pins A8P1-S5 and A8P1-T5.

39. Measure the input voltage between pins A8P1-A7 and A8P1-B7.

C. RECORD

Use Data Sheet 11294 to record:

1. Voltage
2. Phase

DATE ________

TDRR 16920 MAR 2 1965

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

NO. 11294 JDC
REV. –
INITIAL TDRR ______

JOB SEXTANT SHAFT MOTOR DRIVE TEST

ASSEMBLY UNDER TEST

TITLE ________________

SER. NO. ______ DWG. ______ REV. ___

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________________ SER. NO. ______ CAL. DATE

NAME ________________ SER. NO. ______ CAL. DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME / AFFILIATION

JDC STEP	PINS		VOLTAGE (Vac rms)			PHASE **		
	HIGH	LOW	Minimum	Maximum	Actual	Minimum	Maximum	Actual
B.2.a	A8P1-S5	A8P1-T5	-	-	-	162°	198°	
B.2.b	A8J1-27	A8J1-28	5.0	7.0		-	-	-
B.2.c	A8P1-A7	A8P1-B7	(Record)	(Record)		-	-	-
B.4	A8P1-A7	A8P1-B7	(Record)	(Record)		-	-	-
B.5	A8P1-A7	A8P1-B7	0.0029	0.0064		-	-	-
B.7.a	A8P1-M4	A8P1-L4	0.089	0.109		-10°	+10°	
B.7.b	A8J1-10	A8J1-11	0.089	0.109		-	-	-
B.13.a	A8P1-S5	A8P1-T5	-	-	-	162°	198°	
B.13.b	A9P1-D8	A9P1-D7	(Record)	(Record)		-	-	-
B.15	A9P1-D8	A9P1-D7	(Record)	(Record)		-	-	-
B.16	A9P1-D8	A9P1-D7	0.00[illegible]	0.0068		-	-	-
B.18.a	A8P1-M3	A8P1-L3	0.089	0.109		-10°	+10°	
B.18.b	A8J1-9	A8J1-23	0.089	0.109		-	-	-
B.25	A8P1-S5	A8P1-T5	30	-		145°	215°	
B.31.a	A8P1-S5	A8P1-T5	-	-		162°	198°	
B.31.b	A8P1-A3	A8P1-A2	(Record)	(Record)		-	-	-
B.33	A8P1-A3	A8P1-A2	(Record)	(Record)		-	-	-
B.34	A8P1-A3	A8P1-A2	0.0029 v	0.00[illegible] v		-	-	-
B.39	A8P1-A7	A8P1-B7	0.[illegible]*	0.[illegible]7*		-	-	-

*Volts peak to peak
** With respect to input

DATE ______

Released with ATP1007570

TDRR 16920 2 1965

JDC: 11295 REV: A PAGE 1 OF 2
INITIAL TDRR: DS. PGS. 1

JOB: SEXTANT SHAFT ENCODER ELECTRONICS AND DAC TEST
SUBSYSTEM: POWER AND SERVO ASSEMBLY
ASSY:
DESCRIPTION: Test to determine output voltage.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5/26/65	19585		1	WK	TM

REFERENCES:

IMPORTANT: Return all connections to original conditions at the conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Remove the short between pins A7P1-F9 and A7P1-D9.
2. Remove the short between pins A7P1-C9 and A7P1-D9.
3. Connect pin A8P1-P3 to pin A8P1-R5.
4. Apply a 27.5±0.1 vdc source across pins A10P1-T5 and A10P1-P4.
5. Apply a 25.6 kc, modulated test signal across pins A7P1-F9 and A7P1-D9.
6. Apply a 25.6 kc, -90° phase, modulated test signal across pins A7P1-C9 and A7P1-D9.

B. PROCEDURE

1. Measure the output between the pins specified in Table I.

TABLE I
TEST PINS

STEP	HIGH	LOW
a.	A8P1-G4	A8P1-H4
b.	A7J1-3	A7J1-12
c.	A8P1-S5	A8P1-T5

DATE ________

TDRR 16920

JOB: SEXTANT SHAFT ENCODER ELECTRONICS AND DAC TEST
SUBSYSTEM: POWER AND SERVO ASSEMBLY
JDC: 11295 **REV:** A **PAGE** 2 **OF** 2
ASSY:

2. Remove the test signal across pins A7P1-F9 and A7P1-D9.
3. Remove the test signal across pins A7P1-C9 and A7P1-D9.
4. Apply a 25.6 kc, modulated test signal across pins A7P1-C9 and A7P1-D9.
5. Apply a 25.6 kc, -90° phase, modulated test signal across pins A7P1-F9 and A7P1-D9.
6. Measure the output between the pins specified in Table II.

TABLE II
TEST PINS

STEP	HIGH	LOW
a.	A8P1-K4	A8P1-H4
b.	A7J1-4	A7J1-12
c.	A8P7-S5	A8P1-T5

7. Remove the 25.6 kc, -90° phase, modulated test signal from pins A7P1-F9 and A7P1-D9.
8. Connect pin A7P1-F9 to pin A7P1-D9.
9. Remove the 25.6 kc, modulated test signal from pins A7P1-C9 and A7P1-D9.
10. Connect pin A7P1-C9 to pin A7P1-D9.
11. Apply the 3200 pps, command test signal between pins A8P1-G3 and A8P1-H3.
12. Measure the output at pins A8P1-S5 and A8P1-T5.
13. Remove the 3200 pps, command test signal from pins A8P1-G3 and A8P1-H3.
14. Apply the 3200 pps, command test signal between pins A8P1-K3 and A8P1-H3.
15. Measure the output between pins A8P1-S5 and A8P1-T5.

C. RECORD

Use Data Sheet 11295 to record:

1. Voltage
2. Phase
3. Pulse rate ratio

DATE ________

TDRR 16920

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

JDC NO. 11295
REV. A
INITIAL TDRR ________

JOB SEXTANT SHAFT ENCODER ELECTRONICS AND DAC TEST

ASSEMBLY UNDER TEST

TITLE ________
SER. NO. ________ DWG. ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE, LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL. DATE
NAME ________ SER. NO. ________ CAL. DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

OUTPUT

JDC STEP	PINS		VOLTAGE*			PHASE**			PULSE RATE RATIO***	
	High	Low	Min	Max	Actual	Min	Max	Actual	Required	Actual
B.1.a	A8P1-G4	A8P1-H4	5.0	9.0		--	--	--	1:1	
B.1.b	A7J1-3	A7J1-12	16	25.		--	--	--	1:1	
B.1.c	A8P1-S5	A8P1-T5	30Vrms			145°	215°			--
B.6.a	A8P1-K4	A8P1-H4	5.0	9.0		--	--	--	1:1	
B.6.b	A7J1-4	A7J1-12	16	25		--	--	--	1:1	
B.6.c	A8P7-S5	A8P1-T5	30Vrms			-35°	+35°			--
B.12	A8P1-S5	A8P1-T5	30Vrms			-35°	+35°		--	--
B.15	A8P1-S5	A8P1-T5	30Vrms			145°	215°		--	--

*All voltages are zero to peak values unless otherwise specified.
**Phase is with respect to reference at pins A8P1-T1 and A8P1-S1.
***Ratio to 800 pps synchronizing pulse.

DATE ________

Released with ATP1007570

TDRR 16920 MAR 2 1965

JOB: SEXTANT SHAFT ENCODER ELECTRONICS AND DAC TEST	**JDC:** 11295 **REV:** B **PAGE** 1 **OF** 2
	INITIAL TDRR: **DS. PGS:** 1
SUBSYSTEM: POWER AND SERVO ASSEMBLY	**ASSY:**

DESCRIPTION: Test to determine output voltage.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5/26/65	19585		1	WK	TM
B	7/25/66	30329		1	EA	- -

REFERENCES:

IMPORTANT: Return all connections to original conditions at the conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Remove the short between pins A7P1-F9 and A7P1-D9.
2. Remove the short between pins A7P1-C9 and A7P1-D9.
3. Connect pin A8P1-P3 to pin A8P1-R5.
4. Apply a 27.5±0.1 vdc source across pins A10P1-T5 and A10P1-P4.
5. Apply a 25.6 kc, modulated test signal across pins A7P1-F9 and A7P1-D9.
6. Apply a 25.6 kc, -90° phase, modulated test signal across pins A7P1-C9 and A7P1-D9.

B. PROCEDURE

1. Measure the output between the pins specified in Table I.

TABLE I
TEST PINS

STEP	HIGH	LOW
a.	A8P1-G4	A8P1-H4
b.	A7J1-3	A7J1-12
c.	A8P1-S5	A8P1-T5

DATE ________

TDRR 15920 MAR 2 1965

JOB: SEXTANT SHAFT ENCODER ELECTRONICS AND DAC TEST	**JDC:** 11295 **REV:** B **PAGE** 2 **OF** 2
SUBSYSTEM: POWER AND SERVO ASSEMBLY	**ASSY:**

2. Remove the test signal across pins A7P1-F9 and A7P1-D9.
3. Remove the test signal across pins A7P1-C9 and A7P1-D9.
4. Apply a 25.6 kc, modulated test signal across pins A7P1-C9 and A7P1-D9.
5. Apply a 25.6 kc, -90° phase, modulated test signal across pins A7P1-F9 and A7P1-D9.
6. Measure the output between the pins specified in Table II.

TABLE II
TEST PINS

STEP	HIGH	LOW
a.	A8P1-K4	A8P1-H4
b.	A7J1-4	A7J1-12
c.	A8P7-S5	A8P1-T5

7. Remove the 25.6 kc, -90° phase, modulated test signal from pins A7P1-F9 and A7P1-D9.
8. Connect pin A7P1-F9 to pin A7P1-D9.
9. Remove the 25.6 kc, modulated test signal from pins A7P1-C9 and A7P1-D9.
10. Connect pin A7P1-C9 to pin A7P1-D9.
11. Apply the 3200 pps, command test signal between pins A8P1-G3 and A8P1-H3.
12. Measure the output at pins A8P1-S5 and A8P1-T5.
13. Remove the 3200 pps, command test signal from pins A8P1-G3 and A8P1-H3.
14. Apply the 3200 pps, command test signal between pins A8P1-K3 and A8P1-H3.
15. Measure the output between pins A8P1-S5 and A8P1-T5.

C. RECORD

Use Data Sheet 11295 to record:

1. Voltage
2. Phase
3. Pulse rate ratio

DATE ________

TDRR 16920 MAR 2 1965

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

JDC NO. 11295
REV. B
INITIAL TDRR ____

JOB SEXTANT SHAFT ENCODER ELECTRONICS AND DAC TEST

ASSEMBLY UNDER TEST

TITLE ________________

SER. NO. ________ **DWG.** ________ **REV.** ____

TEST HISTORY

DATE ________ START ________ END ________ SITE/LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________________ **SER. NO.** ________ CAL DATE

NAME ________________ **SER. NO.** ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION **APPROVED BY** ________ NAME/AFFILIATION

OUTPUT

JDC STEP	PINS		VOLTAGE*			PHASE**			PULSE RATE RATIO***	
	High	Low	Min	Max	Actual	Min	Max	Actual	Required	Actual
B.1.a	A8P1-G4	A8P1-H4	5.0	9.0		--	--	--	1:1	
B.1.b	A7J1-3	A7J1-12	16	25.		--	--	--	1:1	
B.1.c	A8P1-S5	A8P1-T5	30Vrms			145°	215°			--
B.6.a	A8P1-K4	A8P1-H4	5.0	9.0		--	--	--	1:1	
B.6.b	A7J1-4	A7J1-12	16	25		--	--	--	1:1	
B.6.c	A8P7-S5	A8P1-T5	30Vrms			-35°	+35°			--
B.12	A8P1-S5	A8P1-T5	30Vrms			-35°	+35°		--	--
B.15	A8P1-S5	A8P1-T5	30Vrms			145°	215°		--	--

*All voltages are zero to peak (exclusive of switching transients) unless otherwise specified.
**Phase is with respect to reference at pins A8P1-T1 and A8P1-S1.
***Ratio to 800 pps synchronizing pulse.

DATE ________

TDRR 16920 MAR 2 1965

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 11295
REV. —
INITIAL TDRR ______

JOB SEXTANT SHAFT ENCODER ELECTRONICS AND DAC TEST

ASSEMBLY UNDER TEST

TITLE ______________________

SER. NO. ________ DWG. ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______________________ SER. NO. ________ CAL. DATE

NAME ______________________ SER. NO. ________ CAL. DATE

CONDUCTED BY ________ NAME /AFFILIATION APPROVED BY ________ NAME / AFFILIATION

OUTPUT

JDC	PINS		VOLTAGE*			PHASE**			PULSE RATE RATIO***	
STEP	High	Low	Min	Max	Actual	Min	Max	Actual	Required	Actual
B.1.a	A8P1-G4	A8P1-H4	5.0	9.0		—	—	—	1:1	
B.1.b	A7J1-3	A7J1-12	16	25.		—	—	—	1:1	
B.1.c	A8P1-S5	A8P1-T5	30Vrms			±35°	±35°			—
B.6.a	A8P1-K4	A8P1-H4	5.0	9.0		—	—	—	1:1	
B.6.b	A7J1-4	A7J1-12	16	25		—	—	—	1:1	
B.6.c	A8P7-S5	A8P1-T5	30Vrms			145°	215°			—
B.12	A8P1-S5	A8P1-T5	30Vrms			145°	215°		—	—
B.15	A8P1-[illegible]	A8P1-T5	30Vrms			-35°	+35°		—	—

*All voltages are zero to peak values unless otherwise specified.
**Phase is with respect to reference at pins A8P1-T1 and A8P1-S1.
***Ratio to 800 pps synchronizing pulse.

DATE ________

Released with ATP1007570

TDRR 16920 MAR 2 1965

JOB: SEXTANT SHAFT ENCODER ELECTRONICS AND DAC TEST
JDC: 11295 REV: — PAGE 1 OF 2
INITIAL TDRR: ________ DS. PGS. 1
SUBSYSTEM: POWER AND SERVO ASSEMBLY
ASSY:
DESCRIPTION: Test to determine output voltage.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES:

IMPORTANT: Return all connections to original conditions at the conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Remove the short between pins A7P1-F9 and A7P1-D9.
2. Remove the short between pins A7P1-C9 and A7P1-D9.
3. Connect pin A8P1-P3 to pin A8P1-R6.
4. Apply a 27.5±0.1 vdc source across pins A10P1-T5 and A10P1-P4.
5. Apply a 25.6 kc, modulated test signal across pins A7P1-F9 and A7P1-D9.
6. Apply a 25.6 kc, -90° phase, modulated test signal across pins A7P1-C9 and A7P1-D9.

B. PROCEDURE

1. Measure the output between the pins specified in Table I.

TABLE I
TEST PINS

STEP	HIGH	LOW
a.	A8P1-G4	A8P1-H4
b.	A7J1-3	A7J1-12
c.	A8P1-S5	A8P1-T5

DATE ____

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JOB SEXTANT SHAFT ENCODER ELECTRONICS AND DAC TEST
JDC: 11295 REV: — PAGE 2 OF 2
SUBSYSTEM: POWER AND SERVO ASSEMBLY
ASSY:

2. Remove the test signal across pins A7P1-F9 and A7P1-D9.
3. Remove the test signal across pins A7P1-C9 and A7P1-D9.
4. Apply a 25.6 kc, modulated test signal across pins A7P1-C9 and A7P1-D9.
5. Apply a 25.6 kc, -90° phase, modulated test signal across pins A7P1-F9 and A7P1-D9.
6. Measure the output between the pins specified in Table II.

TABLE II
TEST PINS

STEP	HIGH	LOW
a.	A8P1-K4	A8P1-H4
b.	A7J1-4	A7J1-12
c.	A8P7-S5	A8P1-T5

7. Remove the 25.6 kc, -90° phase, modulated test signal from pins A7P1-F9 and A7P1-D9.
8. Connect pin A7P1-F9 to pin A7P1-D9.
9. Remove the 25.6 kc, modulated test signal from pins A7P1-C9 and A7P1-D9.
10. Connect pin A7P1-C9 to pin A7P1-D9.
11. Apply the 3200 pps, command test signal between pins A8P1-G3 and A8P1-H3.
12. Measure the output at pins A8P1-S5 and A8P1-T5.
13. Remove the 3200 pps, command test signal from pins A8P1-G3 and A8P1-H3.
14. Apply the 3200 pps, command test signal between pins A8P1-K3 and A8P1-H3.
15. Measure the output between pins A8P1-S5 and A8P1-T5.

C. RECORD

Use Data Sheet 11295 to record:

1. Voltage
2. Phase
3. Pulse rate ratio

DATE ________

TDRR 16920

Released with ATP1007570.

MAR 2 1965

JDC: 11296 **REV:** A **PAGE** 1 **OF** 4

INITIAL TDRR: **DS. PGS.** 1

JOB: Sextant Trunnion Motor Drive Test

SUBSYSTEM: Power and Servo Assembly

ASSY:

DESCRIPTION:

Test to determine output voltage of trunnion motor drive amplifier.

Rev. Let	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8/10/65	21504		1	WK	TM

REFERENCES:

IMPORTANT: Return all connections to original conditions at the conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply 27.5±0.1 vdc to pins A10P1-T5 and A10P1-P4.
2. Remove the connection from pins A8P1-A9 and A8P1-B9.
3. Connect an 800 cps test signal to pins A8P1-A9 and A8P1-B9.

B. PROCEDURE

1. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S6 and A8P1-T6.

   NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S6 and A8P1-T6 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between A8P1-S6 and A8P1-T6 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between pins specified in Table I.

TABLE I

TEST PINS

Step	High	Low
a	A8P1-S6	A8P1-T6
b	A8J1-20	A8J1-21
c	A8P1-A9	A8P1-B9

DATE ________

TDRR 16920

MAR 2 1965

JOB: Sextant Trunnion Motor Drive Test

JDC: 11296 **REV:** A **PAGE** 2 **OF** 4

SUBSYSTEM: Power and Servo Assembly

ASSY:

3. Adjust the 800 cps test signal to obtain 5V rms output between pins A8P1-S6 and A8P1-T6.
4. Measure the input voltage between pins A8P1-A9 and A8P1-B9.
5. Calculate the difference between the voltages recorded in steps B.2.c and B.4.
6. Adjust the 800 cps test signal for 0.10V rms between pins A8P1-A9 and A8P1-B9.
7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

Step	High	Low
a	A8P1-M2	A8P1-L2
b	A8J1-10	A8J1-11

8. Remove the 800 cps test signal from pins A8P1-A9 and A8P1-B9.
9. Connect pins A8P1-A9 and A8P1-B9.
10. Remove the connection from pins A9P1-F9 and A9P1-F8.
11. Connect an 800 cps test signal to pins A9P1-F9 and A9P1-F8.
12. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S6 and A8P1-T6.

    NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S6 and A8P1-T6 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between A8P1-S6 and A8P1-T6 passes through the null, reverses phase and increases to 12V rms.

13. Measure the signal between the pins specified in Table III.

TABLE III

TEST PINS

Step	High	Low
a	A8P1-S6	A8P1-T6
b	A9P1-F9	A9P1-F8

DATE ________

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JOB: Sextant Trunnion Motor Drive Test

JDC: 11296 **REV:** A **PAGE** 3 **OF** 4

SUBSYSTEM: Power and Servo Assembly

ASSY:

14. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S6 and A8P1-T6.
15. Measure the input voltage between pins A9P1-F9 and A9P1-F8.
16. Calculate the difference between the voltages recorded in steps B.13.b and B.15.
17. Remove the 800 cps test signal from pins A9P1-F9 and A9P1-F8.
18. Connect pins A9P1-F9 and A9P1-F8.
19. Disconnect pin A9P1-K4 from pin A9P1-K5.
20. Connect an 800 cps test signal to pins A9P1-K4 and A9P1-K5.
21. Connect pins A9P1-P6 and A9P1-S4.
22. Adjust the 800 cps test signal to 0.10V rms.
23. Measure the output between the pins specified in Table IV.

TABLE IV

TEST PINS

Step	High	Low
a	A8P1-M1	A8P1-L1
b	A8J1-2	A8J1-1

24. Remove the 800 cps test signal from pins A9P1-K4 and A9P1-K5.
25. Connect pins A9P1-K4 and A9P1-K5.
26. Remove the connection from pin A9P1-P6 to pin A9P1-S4.
27. Remove the connection from pin A8P1-F1 to pin A8P1-D1.
28. Apply an 800 cps test signal across pins A8P1-F1 and A8P1-D1.
29. Connect pin A8P1-P1 to pin A8P1-R6.
30. Adjust the 800 cps test signal for 9V rms between pins A8P1-F1 and A8P1-D1.
31. Measure the output between the pins specified in Table V.

TABLE V

TEST PINS

Step	High	Low
a	A8P1-S6	A8P1-T6
b	A8P1-F4	A8P1-F5

32. Remove the 800 cps test signal from pins A8P1-F1 and A8P1-D1.
33. Connect pins A8P1-F1 and A8P1-D1.
34. Disconnect pin A8P1-C2 from pin A8P1-C1.
35. Apply an 800 cps test signal between pins A8P1-C2 and A8P1-C1.
36. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S6 and A8P1-T6.
37. Measure the output between the pins specified in Table VI.

DATE ________

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JOB: Sextant Trunnion Motor Drive Test

JDC: 11296 **REV:** A **PAGE** 4 **OF** 4

SUBSYSTEM: Power and Servo Assembly

ASSY:

TABLE VI

TEST PINS

Step	High	Low
a.	A8P1-S6	A8P1-T6
b.	A8P1-C2	A8P1-C1

38. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S6 and A8P1-T6.
39. Measure the input voltage between pins A8P1-C2 and A8P1-C1.
40. Calculate the difference between the voltages recorded in steps B.37.b and B.39.
41. Disconnect pin A8P1-A9 from pin A8P1-B9.
42. Connect an 800 cps modulated test signal source between pins A8P1-A9 and A8P1-B9.
43. Adjust the 800 cps test signal from pins A8P1-C2 and A8P1-C1 to obtain a null at pins A8P1-S6 and A8P1-T6 with the modulated signal set at zero volts.
44. Adjust the 800 cps modulated signal to obtain a 35V pp output between pins A8P1-S6 and A8P1-T6.
45. Measure the input voltage between pins A8P1-A9 and A8P1-B9.

C. RECORD

Use Data Sheet 11296 to record:

1. Voltage
2. Phase

DATE ________

APOLLO G&N TDRR 16920 MAR 2 1965
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 11296
REV. A
INITIAL TDRR ______

JOB Sextant Trunnion Motor Drive Test

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG. ______ REV. ___

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL. DATE
NAME ______ SER. NO. ______ CAL. DATE

CONDUCTED BY ______ NAME / AFFILIATION APPROVED BY ______ NAME / AFFILIATION

JDC STEP	PINS		VOLTAGE (VAC RMS)			PHASE **		
	HIGH	LOW	MINIMUM	MAXIMUM	ACTUAL	MINIMUM	MAXIMUM	ACTUAL
B.2.a	A8P1-S6	A8P1-T6	---	---	---	162°	198°	
B.2.b	A8J1-20	A8J1-21	5.0	7.0		---	---	---
B.2.c	A8P1-A9	A8P1-B9	(Record)	(Record)		---	---	---
B.4	A8P1-A9	A8P1-B9	(Record)	(Record)		---	---	---
B.5	A8P1-A9	A8P1-B9	0.0029	0.0054		---	---	---
B.7.a	A8P1-M2	A8P1-L2	0.089	0.109		-10°	+10°	
B.7.b	A8J1-10	A8J1-11	0.089	0.109		---	---	---
B.13.a	A8P1-S6	A8P1-T6	---	---	---	162°	198°	
B.13.b	A9P1-F9	A9P1-F8	(Record)	(Record)		---	---	---
B.15	A9P1-F9	A9P1-F8	(Record)	(Record)		---	---	---
B.16	A9P1-F9	A9P1-F8	0.0035	0.0065		---	---	---
B.23.a	A8P1-M1	A8P1-L1	0.089	0.109		-10°	+10°	
B.23.b	A8J1-2	A8J1-1	0.089	0.109		---	---	---
B.31.a	A8P1-S6	A8P1-T6	30	---		145°	215°	
B.31.b	A8P1-F4	A8P1-F5	8.9	9.1		---	---	---
B.37.a	A8P1-S6	A8P1-T6	---	---	---	162°	198°	
B.37.b	A8P1-C2	A8P1-C1	(Record)	(Record)		---	---	---
B.39	A8P1-C2	A8P1-C1	(Record)	(Record)		---	---	---
B.40	A8P1-C2	A8P1-C1	0.0100	0.0240		---	---	---
B.45	A8P1-A9	A8P1-B9	0.25*	0.75*		---	---	---

* volts peak to peak
** With respect to input

DATE ______

Released with ATP1007570.

TDRR 16920

MAR 2 1965

JOB: Sextant Trunnion Motor Drive Test

JDC: 11296 **REV:** B **PAGE** 1 **OF** 4

INITIAL TDRR: **DS. PGS.** 1

SUBSYSTEM: Power and Servo Assembly

ASSY:

DESCRIPTION:

Test to determine output voltage of trunnion motor drive amplifier.

Rev. Let	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL AC	APPROVAL NASA
(M) A	8/10/65	21504		1	WK	TM
B	6/8/67	33955		1	MGM EA	--

REFERENCES:

IMPORTANT: Return all connections to original conditions at the conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply 27.5±0.1 vdc to pins A10P1-T5 and A10P1-P4.
2. Remove the connection from pins A8P1-A9 and A8P1-B9.
3. Connect an 800 cps test signal to pins A8P1-A9 and A8P1-B9.

B. PROCEDURE

1. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S6 and A8P1-T6.

   NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S6 and A8P1-T6 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between A8P1-S6 and A8P1-T6 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between pins specified in Table I.

TABLE I

TEST PINS

Step	High	Low
a	A8P1-S6	A8P1-T6
b	A8J1-20	A8J1-21
c	A8P1-A9	A8P1-B9

DATE ________

TDRR 16920

MAR 2 1965

JOB: Sextant Trunnion Motor Drive Test

JDC: 11296 **REV:** B **PAGE** 2 **OF** 4

SUBSYSTEM: Power and Servo Assembly

ASSY:

3. Adjust the 800 cps test signal to obtain 5V rms output between pins A8P1-S6 and A8P1-T6.
4. Measure the input voltage between pins A8P1-A9 and A8P1-B9.
5. Calculate the difference between the voltages recorded in steps B.2.c and B.4.
6. Adjust the 800 cps test signal for 0.10V rms between pins A8P1-A9 and A8P1-B9.
7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

Step	High	Low
a	A8P1-M2	A8P1-L2
b	A8J1-10	A8J1-11

8. Remove the 800 cps test signal from pins A8P1-A9 and A8P1-B9.
9. Connect pins A8P1-A9 and A8P1-B9.
10. Remove the connection from pins A9P1-F9 and A9P1-F8.
11. Connect an 800 cps test signal to pins A9P1-F9 and A9P1-F8.
12. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S6 and A8P1-T6.

    NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S6 and A8P1-T6 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between A8P1-S6 and A8P1-T6 passes through the null, reverses phase and increases to 12V rms.

13. Measure the signal between the pins specified in Table III.

TABLE III

TEST PINS

Step	High	Low
a	A8P1-S6	A8P1-T6
b	A9P1-F9	A9P1-F8

DATE ________

TDRR 16920

MAR 2 1965

JOB: Sextant Trunnion Motor Drive Test

JDC: 11296 **REV:** B **PAGE** 3 **OF** 4

SUBSYSTEM: Power and Servo Assembly

ASSY:

14. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S6 and A8P1-T6.
15. Measure the input voltage between pins A9P1-F9 and A9P1-F8.
16. Calculate the difference between the voltages recorded in steps B.13.b and B.15.
17. Remove the 800 cps test signal from pins A9P1-F9 and A9P1-F8.
18. Connect pins A9P1-F9 and A9P1-F8.
19. Disconnect pin A9P1-K4 from pin A9P1-K5.
20. Connect an 800 cps test signal to pins A9P1-K4 and A9P1-K5.
21. Connect pins A9P1-P6 and A9P1-S4.
22. Adjust the 800 cps test signal to 0.10V rms.
23. Measure the output between the pins specified in Table IV.

TABLE IV

TEST PINS

Step	High	Low
a	A8P1-M1	A8P1-L1
b	A8J1-2	A8J1-1

24. Remove the 800 cps test signal from pins A9P1-K4 and A9P1-K5.
25. Connect pins A9P1-K4 and A9P1-K5.
26. Remove the connection from pin A9P1-P6 to pin A9P1-S4.
27. Remove the connection from pin A8P1-F1 to pin A8P1-D1.
28. Apply an 800 cps test signal across pins A8P1-F1 and A8P1-D1.
29. Connect pin A8P1-P1 to pin A8P1-R6.
30. Adjust the 800 cps test signal for 9V rms between pins A8P1-F1 and A8P1-D1.
31. Measure the output between the pins specified in Table V.

TABLE V

TEST PINS

Step	High	Low
a	A8P1-S6	A8P1-T6
b	A8P1-F4	A8P1-F5

32. Remove the 800 cps test signal from pins A8P1-F1 and A8P1-D1.
33. Connect pins A8P1-F1 and A8P1-D1.
34. Disconnect pin A8P1-C2 from pin A8P1-C1.
35. Apply an 800 cps test signal between pins A8P1-C2 and A8P1-C1.
36. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S6 and A8P1-T6.
37. Measure the output between the pins specified in Table VI.

DATE ________

TDRR 16920

MAR 2 1965

JOB: Sextant Trunnion Motor Drive Test

JDC: 11296 **REV:** B **PAGE** 4 **OF** 4

SUBSYSTEM: Power and Servo Assembly

ASSY:

TABLE VI

TEST PINS

Step	High	Low
a.	A8P1-S6	A8P1-T6
b.	A8P1-C2	A8P1-C1

38. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S6 and A8P1-T6.
39. Measure the input voltage between pins A8P1-C2 and A8P1-C1.
40. Calculate the difference between the voltages recorded in steps B.37.b and B.39.
41. Disconnect pin A8P1-A9 from pin A8P1-B9.
42. Connect an 800 cps modulated test signal source between pins A8P1-A9 and A8P1-B9.
43. Adjust the 800 cps test signal from pins A8P1-C2 and A8P1-C1 to obtain a null at pins A8P1-S6 and A8P1-T6 with the modulated signal set at zero volts.
44. Adjust the 800 cps modulated signal to obtain a 35V pp output between pins A8P1-S6 and A8P1-T6.
45. Measure the input voltage between pins A8P1-A9 and A8P1-B9.

C. RECORD

Use Data Sheet 11296 to record:

1. Voltage
2. Phase

DATE ________

APOLLO G&N TDRR 16920 MAR 2 1965
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

NO. 11296 JDC
REV. B
INITIAL TDRR ____

JOB Sextant Trunnion Motor Drive Test

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG. ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL. DATE
NAME ____ SER. NO. ____ CAL. DATE

CONDUCTED BY ____ NAME /AFFILIATION APPROVED BY ____ NAME / AFFILIATION

JDC STEP	PINS		VOLTAGE (VAC RMS)			PHASE **		
	HIGH	LOW	MINIMUM	MAXIMUM	ACTUAL	MINIMUM	MAXIMUM	ACTUAL
B.2.a	A8P1-S6	A8P1-T6	---	---	---	162°	198°	
B.2.b	A8J1-20	A8J1-21	5.0	7.0		---	---	---
B.2.c	A8P1-A9	A8P1-B9	(Record)	(Record)		---	---	---
B.4	A8P1-A9	A8P1-B9	(Record)	(Record)		---	---	---
B.5	A8P1-A9	A8P1-B9	0.0029	0.0054		---	---	---
B.7.a	A8P1-M2	A8P1-L2	0.089	0.109		-10°	+10°	
B.7.b	A8J1-10	A8J1-11	0.089	0.109		---	---	---
B.13.a	A8P1-S6	A8P1-T6	---	---	---	162°	198°	
B.13.b	A9P1-F9	A9P1-F8	(Record)	(Record)		---	---	---
B.15	A9P1-F9	A9P1-F8	(Record)	(Record)		---	---	---
B.16	A9P1-F9	A9P1-F8	0.0023	0.0066		---	---	---
B.23.a	A8P1-M1	A8P1-L1	0.089	0.109		-10°	+10°	
B.23.b	A8J1-2	A8J1-1	0.089	0.109		---	---	---
B.31.a	A8P1-S6	A8P1-T6	27	---		145°	215°	
B.31.b	A8P1-F4	A8P1-F5	8.9	9.1		---	---	---
B.37.a	A8P1-S6	A8P1-T6	---	---	---	162°	198°	
B.37.b	A8P1-C2	A8P1-C1	(Record)	(Record)		---	---	---
B.39	A8P1-C2	A8P1-C1	(Record)	(Record)		---	---	---
B.40	A8P1-C2	A8P1-C1	0.0100	0.0240		---	---	---
B.45	A8P1-A9	A8P1-B9	0.25*	0.75*		---	---	---

* volts peak-to-peak
** With respect to input

DATE ____

Released with ATP1007570.

TDRR 16920

MAR 2 1965

JOB: Sextant Trunnion Motor Drive Test

JDC: 11296 **REV:** — **PAGE** 1 **OF** 4

INITIAL TDRR: **DS. PGS.** 1

SUBSYSTEM: Power and Servo Assembly

ASSY:

DESCRIPTION:

Test to determine output voltage of trunnion motor drive amplifier.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES:

IMPORTANT: Return all connections to original conditions at the conclusion of this test.

INTERVAL:

TOOLS AND MATERIAL:

A. PREPARATION

1. Apply 27.5±0.1 vdc to pins A10P1-T5 and A10P1-P4.
2. Remove the connection from pins A8P1-A9 and A8P1-B9.
3. Connect an 800 cps test signal to pins A8P1-A9 and A8P1-B9.

B. PROCEDURE

1. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S6 and A8P1-T6.

   NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S6 and A8P1-T6 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between A8P1-S6 and A8P1-T6 passes through the null, reverses phase and increases to 12V rms.

2. Measure the signal between pins specified in Table I.

TABLE I

TEST PINS

Step	High	Low
a	A8P1-S6	A8P1-T6
b	A8J1-20	A8J1-21
c	A8P1-A9	A8P1-B9

DATE ________

TDRR 16920

MAR 2 1965

JOB: Sextant Trunnion Motor Drive Test

JDC: 11296 **REV:** — **PAGE** 2 **OF** 4

SUBSYSTEM: Power and Servo Assembly

ASSY:

3. Adjust the 800 cps test signal to obtain 5V rms output between pins A8P1-S6 and A8P1-T6.
4. Measure the input voltage between pins A8P1-A9 and A8P1-B9.
5. Calculate the difference between the voltages recorded in steps B.2.c and B.4.
6. Adjust the 800 cps test signal for 0.10V rms between pins A8P1-A9 and A8P1-B9.
7. Measure the output between the pins specified in Table II.

TABLE II

TEST PINS

Step	High	Low
a	A8P1-M2	A8P1-L2
b	A8J1-10	A8J1-11

8. Remove the 800 cps test signal from pins A8P1-A9 and A8P1-B9.
9. Connect pins A8P1-A9 and A8P1-B9.
10. Remove the connection from pins A9P1-F9 and A9P1-F8.
11. Connect an 800 cps test signal to pins A9P1-F9 and A9P1-F8.
12. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S6 and A8P1-T6.

    NOTE: Adjust the test signal amplitude and phase (0 or π) such that the voltage between pins A8P1-S6 and A8P1-T6 is nulled if there is an output signal with no input signal applied. Increase the test (input) signal so that the voltage between A8P1-S6 and A8P1-T6 passes through the null, reverses phase and increases to 12V rms.

13. Measure the signal between the pins specified in Table III.

TABLE III

TEST PINS

Step	High	Low
a	A8P1-S6	A8P1-T6
b	A9P1-F9	A9P1-F8

DATE ________

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JOB: Sextant Trunnion Motor Drive Test

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SUBSYSTEM: Power and Servo Assembly

ASSY:

14. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S6 and A8P1-T6.
15. Measure the input voltage between pins A9P1-F9 and A9P1-F8.
16. Calculate the difference between the voltages recorded in steps B.13.b and B.15.
17. Remove the 800 cps test signal from pins A9P1-F9 and A9P1-F8.
18. Connect pins A9P1-F9 and A9P1-F8.
19. Disconnect pin A9P1-K4 from pin A9P1-K5.
20. Connect an 800 cps test signal to pins A9P1-K4 and A9P1-K5.
21. Connect pins A9P1-P6 and A9P1-S4.
22. Adjust the 800 cps test signal to 0.10V rms.
23. Measure the output between the pins specified in Table IV.

TABLE IV

TEST PINS

Step	High	Low
a	A8P1-M1	A8P1-L1
b	A8J1-2	A8J1-1

24. Remove the 800 cps test signal from pins A9P1-K4 and A9P1-K5.
25. Connect pins A9P1-K4 and A9P1-K5.
26. Remove the connection from pin A9P1-P6 to pin A9P1-S4.
27. Remove the connection from pin A8P1-F1 to pin A8P1-D1.
28. Apply an 800 cps test signal across pins A8P1-F1 and A8P1-D1.
29. Connect pin A8P1-P1 to pin A8P1-R6.
30. Adjust the 800 cps test signal for 9V rms between pins A8P1-F1 and A8P1-D1.
31. Measure the output between the pins specified in Table V.

TABLE V

TEST PINS

Step	High	Low
a	A8P1-S6	A8P1-T6
b	A8P1-F4	A8P1-F5

32. Remove the 800 cps test signal from pins A8P1-F1 and A8P1-D1.
33. Connect pins A8P1-F1 and A8P1-D1.
34. Disconnect pin A8P1-C2 from pin A8P1-C1.
35. Apply an 800 cps test signal between pins A8P1-C2 and A8P1-C1.
36. Adjust the 800 cps test signal to obtain a 12V rms output between pins A8P1-S6 and A8P1-T6.
37. Measure the output between the pins specified in Table VI.

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JOB: Sextant Trunnion Motor Drive Test

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SUBSYSTEM: Power and Servo Assembly

ASSY:

TABLE VI

TEST PINS

Step	High	Low
a.	A8P1-S6	A8P1-T6
b.	A8P1-C2	A8P1-C1

38. Adjust the 800 cps test signal to obtain a 5V rms output between pins A8P1-S6 and A8P1-T6.
39. Measure the input voltage between pins A8P1-C2 and A8P1-C1. and A8P1-C1.
40. Calculate the difference between the voltages recorded in steps B.37.b and B.39.
41. Disconnect pin A8P1-A9 from pin A8P1-B9.
42. Connect an 800 cps modulated test signal source between pins A8P1-A9 and A8P1-B9.
43. Adjust the 800 cps test signal from pins A8P1-C2 and A8P1-C1 to obtain a null at pins A8P1-S6 and A8P1-T6 with the modulated signal set at zero volts.
44. Adjust the 800 cps modulated signal to obtain a 35V pp output between pins A8P1-S6 and A8P1-T6.
45. Measure the input voltage between pins A8P1-A9 and A8P1-B9.

C. RECORD

Use Data Sheet 11296 to record:

1. Voltage
2. Phase

DATE ________

APOLLO G&N TDRR 16920 MAR 2 1965
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 11296 JDC
REV. —
INITIAL TDRR ______

JOB Sextant Trunnion Motor Drive Test

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG. ______ REV. ___

TEST HISTORY

DATE ______ START ______ END ______ SITE/LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL. DATE ______
NAME ______ SER. NO. ______ CAL. DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC STEP	PINS		VOLTAGE (VAC RMS)			PHASE **		
	HIGH	LOW	MINIMUM	MAXIMUM	ACTUAL	MINIMUM	MAXIMUM	ACTUAL
B.2.a	A8P1-S6	A8P1-T6	---	---	---	182°	198°	
B.2.b	A8J1-20	A8J1-21	5.0	7.0		---	---	---
B.2.c	A8P1-A9	A8P1-B9	(Record)	(Record)		---	---	---
B.4	A8P1-A9	A8P1-B9	(Record)	(Record)		---	---	---
B.5	A8P1-A9	A8P1-B9	0.0029	0.0054		---	---	---
B.7.a	A8P1-M2	A8P1-L2	0.089	0.109		-10°	+10°	
B.7.b	A8J1-10	A8J1-11	0.089	0.109		---	---	---
B.13.a	A8P1-S6	A8P1-T6	---	---	---	182°	198°	
B.13.b	A9P1-F9	A9P1-F8	(Record)	(Record)		---	---	---
B.15	A9P1-F9	A9P1-F8	(Record)	(Record)		---	---	---
B.16	A9P1-F9	A9P1-F8	0.0033	0.0066		---	---	---
B.23.a	A8P1-M1	A8P1-L1	0.089	0.109		-10°	+10°	
B.23.b	A8J1-2	A8J1-1	0.089	0.109		---	---	---
B.31.a	A8P1-S6	A8P1-T6	30	---		145°	215°	
B.31.b	A8P1-F4	A8P1-F5	8.9	9.1		---	---	---
B.37.a	A8P1-S6	A8P1-T6	---	---	---	-18°	+18°	
B.37.b	A8P1-C2	A8P1-C1	(Record)	(Record)		---	---	---
B.39	A8P1-C2	A8P1-C1	(Record)	(Record)		---	---	---
B.40	A8P1-C2	A8P1-C1	0.0023v	0.0065v		---	---	---
B.45	A8P1-A9	A8P1-B9	0.25v*	0.55v*		---	---	---

* volts peak-to-peak
** With respect to input

DATE ______

JOB G & N SYSTEM VISUAL INSPECTION
JDC 12200 REV. A PAGE 1 OF 2
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SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION Final inspection of workmanship, quantity, markings and prior compliance. Time required for G & N system testing is recorded.

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			JDC	D.S.	MIT	NASA
A	11-10-66	31882	1	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that the G & N System has been finished in a thorough workmanship like manner without subassembly separation.

PROCEDURE

1. Inspect the following equipment in accordance with step 2 without G & N System Subassembly separation:

a. Inertial Measurement Unit
b. PIPA Electronics Assembly
c. Coupling Display Unit
d. Power Servo Assembly
e. Command Guidance Computer

NOTE: System testing may be performed with one DSKY if two DSKY's are not available.

f. Nav DSKY
g. Main DSKY
h. G & N Interconnect Harness "A" Assembly
i. G & N Interconnect Harness "B" Assembly
j. G & N Interconnect Harness "C" Assembly
k. G & N Interconnect Harness "D" Assembly
l. G & N Interconnect Harness "E" Assembly
m. G & N Interconnect Harness "F" Assembly
n. G & N Interconnect Harness "G" Assembly

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM [illegible]

JOB G & N SYSTEM VISUAL INSPECTION
JDC 12200 REV A PAGE 2 OF 2

SUBSYSTEM G & N SYSTEM
ASSY

o. G & N Interconnect Harness "H" Assembly
p. G & N Indicator Control Panel
q. Nav Base Assembly
r. Optical Unit Assembly

2. Record the indications resulting from the following inspections performed on the equipment called out in step 1.

a. Insure that all units have met their respective subassembly requirements by a review of inspection status indications such as tags and stamps.
b. Harnesses for nicks, scratches, wire abrasions, loose lacing, dents, encapsulant defects, and pin condition.
c. Mating surfaces for cracks and foreign material.
d. Markings for legibility, appearance and proper registration.
e. Surfaces for scratches, dents, nicks or other obvious defects.
f. All potting material for condition.
g. All plugs and jacks for pin conditions.

G & N SYSTEM TEST TIME

3. Observe and record the following ETI readings indicated on the Power Supply Load Panel:

a. ISS OPERATE
b. WHEEL
c. AGC/LGC
d. OPTICS
e. OIA ON
f. ISS STANDBY

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 20

JDC
NO. 12200
REV. A
INITIAL TDRR 29882

JOB G & N SYSTEM VISUAL INSPECTION

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	REJ	ACC
	INERTIAL MEASUREMENT UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 20

JDC
NO. 12200
REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	PIPA ELECTRONICS ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 20

JDC
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JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	COUPLING DISPLAY UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 20

JDC
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REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REF	ACC
	POWER SERVO ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
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JDC
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REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	COMMAND GUIDANCE COMPUTER		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Surfaces		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12200
REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	NAV DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 20

JDC
NO. 12200
REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	MAIN DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12200
REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "A" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12200
REV. A

JOB

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "B" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
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JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REF	ACC
	G & N INTERCONNECT HARNESS "C" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
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REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "D" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
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JDC
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REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "E" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 13 OF 20

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JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "F" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
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REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "G" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 15 **OF** 20

JDC
NO. 12200
REV. A

JOB

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "H" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 16 **OF** 20

JDC
NO. 12200
REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INDICATOR CONTROL PANEL		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 17 **OF** 20

JDC
NO. 12200
REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	NAV BASE ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 18 **OF** 20

JDC
NO. 12200
REV. A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	OPTICAL UNIT ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 19 **OF** 20

JDC
NO. 12200
REV A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.a	ISS OPERATE Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS OPERATE Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.b	WHEEL Elapsed Time Test Start	hrs	▨		▨	▨	▨
	WHEEL Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.c	AGC/LGC Elapsed Time Test Start	hrs	▨		▨	▨	▨
	AGC/LGC Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.d	OPTICS Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OPTICS Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.e	OIA ON Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OIA ON Elapsed Time Test Complete	hrs	▨		▨	▨	▨

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 20 **OF** 20

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12200
REV A

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.f	ISS STANDBY Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS STANDBY Elapsed Time Test Complete	hrs	▨		▨	▨	▨

DATE 30 JUN 66

JOB G & N SYSTEM VISUAL INSPECTION	JDC 12200 REV. B PAGE 1 OF 2 INITIAL TDRR 29882 D.S. PGS 20
SUBSYSTEM G & N SYSTEM	ASSY.

DESCRIPTION Final inspection of workmanship, quantity, markings and prior compliance. Time required for G & N system testing is recorded.

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			JDC	D.S.	MIT	NASA
A	11-10-66	31882	1	-	EA	-
B	2-23-67	33057	1	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that the G & N System has been finished in a thorough workmanship like manner without subassembly separation.

PROCEDURE

1. Inspect the following equipment in accordance with step 2 without G & N System Subassembly separation:

   NOTE: If continuing from ISS Testing and/or OSS Testing do not inspect items a, b, c, d, p, q, and r.

   a. Inertial Measurement Unit
   b. PIPA Electronics Assembly
   c. Coupling Display Unit
   d. Power Servo Assembly
   e. Command Guidance Computer

      NOTE: System testing may be performed with one DSKY if two DSKY's are not available.

   f. Nav DSKY
   g. Main DSKY
   h. G & N Interconnect Harness "A" Assembly
   i. G & N Interconnect Harness "B" Assembly
   j. G & N Interconnect Harness "C" Assembly
   k. G & N Interconnect Harness "D" Assembly
   l. G & N Interconnect Harness "E" Assembly

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM 0014BA
Ch. 3-18-66

JOB G & N SYSTEM VISUAL INSPECTION	JDC 12200 REV B PAGE 2 OF 2
SUBSYSTEM G & N SYSTEM	ASSY

m. G & N Interconnect Harness "F" Assembly
n. G & N Interconnect Harness "G" Assembly
o. G & N Interconnect Harness "H" Assembly
p. G & N Indicator Control Panel
q. Nav Base Assembly
r. Optical Unit Assembly

2. Record the indications resulting from the following inspections performed on the equipment called out in step 1.

   a. Insure that all units have met their respective subassembly requirements by a review of inspection status indications such as tags and stamps.
   b. Harnesses for nicks, scratches, wire abrasions, loose lacing, dents, encapsulant defects, and pin condition.
   c. Mating surfaces for cracks and foreign material.
   d. Markings for legibility, appearance and proper registration.
   e. Surfaces for scratches, dents, nicks or other obvious defects.
   f. All potting material for condition.
   g. All plugs and jacks for pin conditions.

G & N SYSTEM TEST TIME

3. Observe and record the following ETI readings indicated on the Power Supply Load Panel:

   a. ISS OPERATE
   b. WHEEL
   c. AGC/LGC
   d. OPTICS
   e. OIA ON
   f. ISS STANDBY

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 20

JDC
NO. 12200
REV. B
INITIAL TDRR 29882

JOB G & N SYSTEM VISUAL INSPECTION

ASSEMBLY UNDER TEST
TITLE ____________
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____________ SER. NO. ______ CAL DATE
NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	REJ	ACC
	INERTIAL MEASUREMENT UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	PIPA ELECTRONICS ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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FORM 0014S
Chg. 7-23-6

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	COUPLING DISPLAY UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 0048
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REF	ACC
	POWER SERVO ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 0048
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	COMMAND GUIDANCE COMPUTER		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Surfaces		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 0048
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	NAV DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 0048
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 20

JDC
NO. 12200
REV. I

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	MAIN DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 60148
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "A" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 60148
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 **OF** 20

JDC
NO. 12200
REV. I

JOB

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "B" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 60148
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 **OF** 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REF	ACC
	G & N INTERCONNECT HARNESS "C" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 60148
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 20

JDC
NO. 12200
REV B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "D" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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FCR 1-0148
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 12 OF 20

JDC
NO. 12200
REV B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "E" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FCR 1-0148
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 13 OF 20

JDC
NO. 12200
REV B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "F" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FCR 1-0148
Chg. 7-13-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 14 OF 20

JDC
NO. 12200
REV B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "G" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FCR 1-0148
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 15 **OF** 20

JDC
NO. 12200
REV. B

JOB

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "H" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 0018
Chg 7-13-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 16 **OF** 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INDICATOR CONTROL PANEL		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 0018
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 17 **OF** 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	NAV BASE ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

FORM 0018
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 18 **OF** 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	OPTICAL UNIT ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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FORM 0018
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 19 OF 20

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.a	ISS OPERATE Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS OPERATE Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.b	WHEEL Elapsed Time Test Start	hrs	▨		▨	▨	▨
	WHEEL Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.c	AGC/LGC Elapsed Time Test Start	hrs	▨		▨	▨	▨
	AGC/LGC Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.d	OPTICS Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OPTICS Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.e	OIA ON Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OIA ON Elapsed Time Test Complete	hrs	▨		▨	▨	▨

DATE 30 JUN 66

FORM 00147
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 20 OF 20

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12200
REV. B

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.f	ISS STANDBY Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS STANDBY Elapsed Time Test Complete	hrs	▨		▨	▨	▨

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FORM 00145
[illegible] 9-30-65

JOB G & N SYSTEM VISUAL INSPECTION

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INITIAL TDRR 29882 D.S. PGS 20

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Final inspection of workmanship, quantity, markings and prior compliance. Time required for G & N system testing is recorded.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31882	1	-	EA	-
B	2-23-67	33057	1	-	EA	-
C	7-12-67	34160	-	8 thru 15	SB	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that the G & N System has been finished in a thorough workmanship like manner without subassembly separation.

PROCEDURE

1. Inspect the following equipment in accordance with step 2 without G & N System Subassembly separation:

NOTE: If continuing from ISS Testing and/or OSS Testing do not inspect items a, b, c, d, p, q, and r.

a. Inertial Measurement Unit
b. PIPA Electronics Assembly
c. Coupling Display Unit
d. Power Servo Assembly
e. Command Guidance Computer

NOTE: System testing may be performed with one DSKY if two DSKY's are not available.

f. Nav DSKY
g. Main DSKY
h. G & N Interconnect Harness "A" Assembly
i. G & N Interconnect Harness "B" Assembly
j. G & N Interconnect Harness "C" Assembly
k. G & N Interconnect Harness "D" Assembly
l. G & N Interconnect Harness "E" Assembly

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB G & N SYSTEM VISUAL INSPECTION | JDC 12200 REV C PAGE 2 OF 2

SUBSYSTEM G & N SYSTEM | ASSY

m. G & N Interconnect Harness "F" Assembly
n. G & N Interconnect Harness "G" Assembly
o. G & N Interconnect Harness "H" Assembly
p. G & N Indicator Control Panel
q. Nav Base Assembly
r. Optical Unit Assembly

2. Record the indications resulting from the following inspections performed on the equipment called out in step 1.

a. Insure that all units have met their respective subassembly requirements by a review of inspection status indications such as tags and stamps.
b. Harnesses for nicks, scratches, wire abrasions, loose lacing, dents, encapsulant defects, and pin condition.
c. Mating surfaces for cracks and foreign material.
d. Markings for legibility, appearance and proper registration.
e. Surfaces for scratches, dents, nicks or other obvious defects.
f. All potting material for condition.
g. All plugs and jacks for pin conditions.

G & N SYSTEM TEST TIME

3. Observe and record the following ETI readings indicated on the Power Supply Load Panel:

a. ISS OPERATE
b. WHEEL
c. AGC/LGC
d. OPTICS
e. OIA ON
f. ISS STANDBY

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 20

JDC
NO. 12200
REV. C
INITIAL TDRR 29882

JOB G & N SYSTEM VISUAL INSPECTION

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	REJ	ACC
	INERTIAL MEASUREMENT UNIT		
2. a	Applicable Inspections		
2. b	Harnesses		
2. c	Mating Surfaces		
2. d	Markings		
2. e	Surfaces		
2. f	Potting Material		
2. g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	PIPA ELECTRONICS ASSEMBLY		
2. a	Applicable Inspections		
2. b	Harnesses		
2. c	Mating Surfaces		
2. d	Markings		
2. e	Surfaces		
2. f	Potting Material		
2. g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	COUPLING DISPLAY UNIT		
2. a	Applicable Inspections		
2. b	Harnesses		
2. c	Mating Surfaces		
2. d	Markings		
2. e	Surfaces		
2. f	Potting Material		
2. g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REF	ACC
	POWER SERVO ASSEMBLY		
2. a	Applicable Inspections		
2. b	Harnesses		
2. c	Mating Surfaces		
2. d	Markings		
2. e	Surfaces		
2. f	Potting Material		
2. g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	COMMAND GUIDANCE COMPUTER		
2. a	Applicable Inspections		
2. b	Harnesses		
2. c	Mating Surfaces		
2. d	Surfaces		
2. e	Surfaces		
2. f	Potting Material		
2. g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	NAV DSKY		
2. a	Applicable Inspections		
2. b	Harnesses		
2. c	Mating Surfaces		
2. d	Markings		
2. e	Surfaces		
2. f	Potting Material		
2. g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	MAIN DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
2.a	G & N INTERCONNECT HARNESS "A" ASSEMBLY Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 **OF** 20

JDC
NO. 12200
REV. C

JOB

JDC ITEM NO.	PARAMETER	REJ	ACC
2.a	G & N INTERCONNECT HARNESS "B" ASSEMBLY Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 **OF** 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REF	ACC
2.a	G & N INTERCONNECT HARNESS "C" ASSEMBLY Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "D" ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 12 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "E" ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 13 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "F" ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 14 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "G" ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 15 OF 20

JDC
NO. 12200
REV. C

JOB

JDC ITEM NO.	PARAMETER	REJ	ACC
2.a	G & N INTERCONNECT HARNESS "H" ASSEMBLY Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 16 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
2.a	G & N INDICATOR CONTROL PANEL Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 17 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
2.a	NAV BASE ASSEMBLY Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 18 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
2.a	OPTICAL UNIT ASSEMBLY Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 19 OF 20

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.a	ISS OPERATE Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS OPERATE Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.b	WHEEL Elapsed Time Test Start	hrs	▨		▨	▨	▨
	WHEEL Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.c	AGC/LGC Elapsed Time Test Start	hrs	▨		▨	▨	▨
	AGC/LGC Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.d	OPTICS Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OPTICS Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.e	OIA ON Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OIA ON Elapsed Time Test Complete	hrs	▨		▨	▨	▨

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 20 OF 20

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12200
REV. C

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.f	ISS STANDBY Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS STANDBY Elapsed Time Test Complete	hrs	▨		▨	▨	▨

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JOB G & N SYSTEM VISUAL INSPECTION

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Final inspection of workmanship, quantity, markings and prior compliance. Time required for G & N system testing is recorded.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31882	1	-	EA	-
B	2-23-67	33057	1	-	EA	-
C	7-12-67	34160	-	8 thru 15	SB	-
D	3-22-68	35902	1	5, 9, 15	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that the G & N System has been finished in a thorough workmanship like manner without subassembly separation.

PROCEDURE

1. Inspect the following equipment in accordance with step 2 without G & N System Subassembly separation:

NOTE: If continuing from ISS Testing and/or OSS Testing do not inspect items a, b, c, d, p, q, and r.

a. Inertial Measurement Unit
b. PIPA Electronics Assembly
c. Coupling Display Unit
d. Power Servo Assembly
e. Command Guidance Computer

NOTE: System testing may be performed with one DSKY if two DSKY's are not available.

f. Nav DSKY
g. Main DSKY
h. G & N Interconnect Harness "A" Assembly
i. G & N Interconnect Harness "B" Assembly

NOTE: In handling microdot connectors, observe the following precautions. At all times, keep in mind the fact that microdot connectors have a locking action which is

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB G & N SYSTEM VISUAL INSPECTION
JDC 12200 REV D PAGE 2 OF 3
SUBSYSTEM G & N SYSTEM
ASSY

opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

1. When the plug is disengaged from the receptacle, the ENGAGE marks on the locking ring and main connector body should be aligned and the locking ring should be immovable under light pressure. (If the ENGAGE marks are not aligned at disengagement and/or the locking ring can be rotated, the connector is defective.)

2. The plug is mated to the receptacle using straight-line, push-in, hand pressure. Full engagement is indicated by an audible click. After engagement, the locking ring should be free to rotate 1/8 turn to lock position when the plug and receptacle are aligned. (If the ring cannot be rotated, the plug and receptacle are not fully engaged. If the connection does not hold with the ring in the LOCK position, the connector is defective.)

3. Connectors are disengaged using special tool FA 757702-006 or special tool FA 757702-007. The locking ring is rotated from LOCK to ENGAGE and the finger blade(s) of the tool are inserted between plug and receptacle. Pressure on the tool handle(s) forces connectors apart. Manual disconnection is not recommended since connector damage may result. (If the connector halves can be separated without rotating the ring to engage or if the ring will not rotate from LOCK to ENGAGE, the connector is defective.)

4. Protective covers for exposed microdot connectors are inserted by hand pressure but should be removed using special connector cover removal tool FA 757702-005.

j. G & N Interconnect Harness "C" Assembly
k. G & N Interconnect Harness "D" Assembly
l. G & N Interconnect Harness "E" Assembly

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JOB G & N SYSTEM VISUAL INSPECTION
JDC 12200 REV D PAGE 3 OF 3
SUBSYSTEM G & N SYSTEM
ASSY

m. G & N Interconnect Harness "F" Assembly
n. G & N Interconnect Harness "G" Assembly
o. G & N Interconnect Harness "H" Assembly
p. G & N Indicator Control Panel
q. Nav Base Assembly
r. Optical Unit Assembly

2. Record the indications resulting from the following inspections performed on the equipment called out in step 1.

a. Insure that all units have met their respective subassembly requirements by a review of inspection status indications such as tags and stamps.
b. Harnesses for nicks, scratches, wire abrasions, loose lacing, dents, encapsulant defects, and pin condition.
c. Mating surfaces for cracks and foreign material.
d. Markings for legibility, appearance and proper registration.
e. Surfaces for scratches, dents, nicks or other obvious defects.
f. All potting material for condition.
g. All plugs and jacks for pin conditions.

G & N SYSTEM TEST TIME

3. Observe and record the following ETI readings indicated on the Power Supply Load Panel:

a. ISS OPERATE
b. WHEEL
c. AGC/LGC
d. OPTICS
e. OIA ON
f. ISS STANDBY

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 20

NO. 12200 JDC
REV. D
INITIAL TDRR 29882

JOB G & N SYSTEM VISUAL INSPECTION

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	REJ	ACC
	INERTIAL MEASUREMENT UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	PIPA ELECTRONICS ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	COUPLING DISPLAY UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REF	ACC
	POWER SERVO ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	COMMAND GUIDANCE COMPUTER		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	NAV DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	MAIN DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "A" ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "B" ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REF	ACC
 2.a	G & N INTERCONNECT HARNESS "C" ASSEMBLY Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
 2.a	G & N INTERCONNECT HARNESS "D" ASSEMBLY Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 12 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
 2.a	G & N INTERCONNECT HARNESS "E" ASSEMBLY Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 13 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
 2.a	G & N INTERCONNECT HARNESS "F" ASSEMBLY Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 14 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
2.a	G & N INTERCONNECT HARNESS "G" ASSEMBLY Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 15 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
2.a	G & N INTERCONNECT HARNESS "H" ASSEMBLY Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurance. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 16 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
2.a	G & N INDICATOR CONTROL PANEL Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 17 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
2.a	NAV BASE ASSEMBLY Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 18 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	OPTICAL UNIT ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 19 OF 20

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.a	ISS OPERATE Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS OPERATE Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.b	WHEEL Elapsed Time Test Start	hrs	▨		▨	▨	▨
	WHEEL Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.c	AGC/LGC Elapsed Time Test Start	hrs	▨		▨	▨	▨
	AGC/LGC Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.d	OPTICS Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OPTICS Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.e	OIA ON Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OIA ON Elapsed Time Test Complete	hrs	▨		▨	▨	▨

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 20 OF 20

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12200
REV. D

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.f	ISS STANDBY Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS STANDBY Elapsed Time Test Complete	hrs	▨		▨	▨	▨

DATE 30 JUN 66

JOB G & N SYSTEM VISUAL INSPECTION | JDC 12200 REV. - PAGE 1 OF 2 | INITIAL TDRR 29882 D.S. PGS 20

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Final inspection of workmanship, quantity, markings and prior compliance. Time required for G & N system testing is recorded.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that the G & N System has been finished in a thorough workmanship like manner without subassembly separation.

PROCEDURE

1. Inspect the following equipment in accordance with step 2 without G & N System Subassembly separation:
   - a. Inertial Measurement Unit
   - b. PIPA Electronics Assembly
   - c. Coupling Display Unit
   - d. Power Servo Assembly
   - e. Command Guidance Computer
   - f. Nav DSKY
   - g. Main DSKY
   - h. G & N Interconnect Harness "A" Assembly
   - i. G & N Interconnect Harness "B" Assembly
   - j. G & N Interconnect Harness "C" Assembly
   - k. G & N Interconnect Harness "D" Assembly
   - l. G & N Interconnect Harness "E" Assembly
   - m. G & N Interconnect Harness "F" Assembly
   - n. G & N Interconnect Harness "G" Assembly

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB G & N SYSTEM VISUAL INSPECTION | JDC 12200 REV - PAGE 2 OF 2

SUBSYSTEM G & N SYSTEM | ASSY

   - o. G & N Interconnect Harness "H" Assembly
   - p. G & N Indicator Control Panel
   - q. Nav Base Assembly
   - r. Optical Unit Assembly

2. Record the indications resulting from the following inspections performed on the equipment called out in step 1.
   - a. Insure that all units have met their respective subassembly requirements by a review of inspection status indications such as tags and stamps.
   - b. Harnesses for nicks, scratches, wire abrasions, loose lacing, dents, encapsulant defects, and pin condition.
   - c. Mating surfaces for cracks and foreign material.
   - d. Markings for legibility, appearance and proper registration.
   - e. Surfaces for scratches, dents, nicks or other obvious defects.
   - f. All potting material for condition.
   - g. All plugs and jacks for pin conditions.

G & N SYSTEM TEST TIME

3. **Observe and record the following ETI readings indicated on the Power Supply Load Panel:**
   - a. **ISS OPERATE**
   - b. **WHEEL**
   - c. **AGC/LGC**
   - d. **OPTICS**
   - e. **OIA ON**
   - f. **ISS STANDBY**

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 20

JDC NO. 12200
REV. -
INITIAL TDRR 29882

JOB G & N SYSTEM VISUAL INSPECTION

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ________ DWG ________ REV. ________

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION ________

TIME ________ START ________ END ________ TOTAL ELAPSED ________

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE ________

NAME ________ SER. NO. ________ CAL DATE ________

CONDUCTED BY ________ NAME/AFFILIATION

APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	REJ	ACC
	INERTIAL MEASUREMENT UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 20

JDC NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	PIPA ELECTRONICS ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	COUPLING DISPLAY UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REF	ACC
	POWER SERVO ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	NAV DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	COMMAND GUIDANCE COMPUTER		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Surfaces		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	MAIN DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

FORM 0148
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "A" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

FORM 0148
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REF	ACC
	G & N INTERCONNECT HARNESS "C" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 20

JDC
NO. 12200
REV. -

JOB ______

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "B" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "D" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 12 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "E" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 13 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "F" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 14 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "G" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 15 OF 20

JDC
NO. 12200
REV. -

JOB

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INTERCONNECT HARNESS "H" ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 16 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	G & N INDICATOR CONTROL PANEL		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 17 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	NAV BASE ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 18 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	REJ	ACC
	OPTICAL UNIT ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 19 OF 20

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.a	ISS OPERATE Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS OPERATE Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.b	WHEEL Elapsed Time Test Start	hrs	▨		▨	▨	▨
	WHEEL Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.c	AGC/LGC Elapsed Time Test Start	hrs	▨		▨	▨	▨
	AGC/LGC Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.d	OPTICS Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OPTICS Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.e	OIA ON Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OIA ON Elapsed Time Test Complete	hrs	▨		▨	▨	▨

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 20 OF 20

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12200
REV. -

JOB G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.f	ISS STANDBY Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS STANDBY Elapsed Time Test Complete	hrs	▨		▨	▨	▨

DATE ______

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV. A PAGE 1 OF 13

INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV A PAGE 2 OF 13

SUBSYSTEM G & N SYSTEM

ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Grease (G.S. #53087)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 1.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-24) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

DATE 30 JUN 66

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV A PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

18. Connect 56P18 of the "B" Harness to 45J5 of the PSA using Gasket (FD770054) between connectors 56P18 and 45J5. Torque connector screws sequentially to 14 ± 1 inch-pounds.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Connect 56P27 of the "H" Harness to 45J8 of the PSA using Gasket (FD770054) between connectors 56P27 and 45J8. Torque connector screws sequentially to 14 ± 1 inch-pounds.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Connect 56P19 of the "C" Harness to 45J6 of the PSA using Gasket (FD770054) between connectors 56P19 and 45J6. Torque connector screws sequentially to 14 ± 1 inch-pounds.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Connect 56P29 of the "G" Harness to 45J10 of the PSA using Gasket (FD770054) between connectors 56P29 and 45J10. Torque connector screws sequentially to 14 ± 1 inch-pounds.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

26. Connect 56P28 of the "F" Harness to 45J9 of the PSA using Gasket (FD770054) between connectors 56P28 and 45J9. Torque the connector screws sequentially to 14 ± 1 inch-pounds.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV A PAGE 4 OF 13

SUBSYSTEM G & N SYSTEM

ASSY

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power
	A30J2	P1	W27 (1900871)	P2	J1	Console
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

DATE 30 JUN 66

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	W161
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W207

Table I (Cont.)

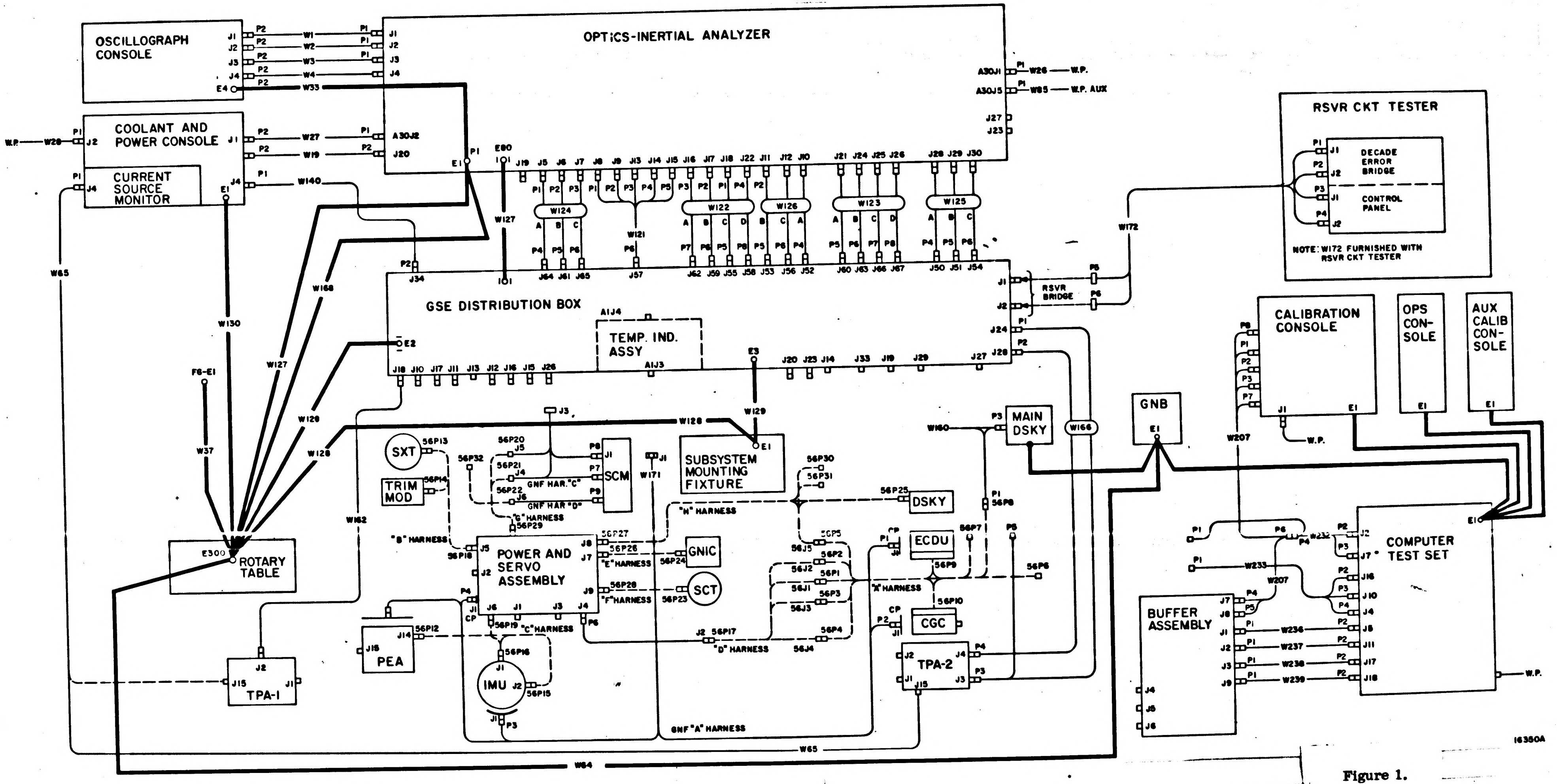
GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console *		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (2900753)	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCM
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING	JDC 12201 REV A PAGE 7 OF 13
SUBSYSTEM G & N SYSTEM	ASSY



OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
RSVR BRIDGE
CALIBRATION CONSOLE
OPS CON-SOLE
AUX CALIB CON-SOLE
GNB
MAIN DSKY
SUBSYSTEM MOUNTING FIXTURE
SXT
TRIM MOD
SCM
DSKY
POWER AND SERVO ASSEMBLY
GNIC
SCT
ECDU
CGC
ROTARY TABLE
E300
PEA
IMU
TPA-1
TPA-2
COMPUTER TEST SET
BUFFER ASSEMBLY
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"F" HARNESS
"H" HARNESS
"A" HARNESS
GNF HAR "C"
GNF HAR "D"
GNF "A" HARNESS
W1
W2
W3
W4
W33
W26
W.P.
W65
W.P. AUX
W27
W19
W29
W140
W130
W37
W127
W168
W128
W129
W162
W171
W124
W121
W122
W126
W123
W125
W172
W166
W160
W207
W233
W232
W234
W237
W238
W239
W64
16350A

Figure 1.

DATE 30 JUN 66

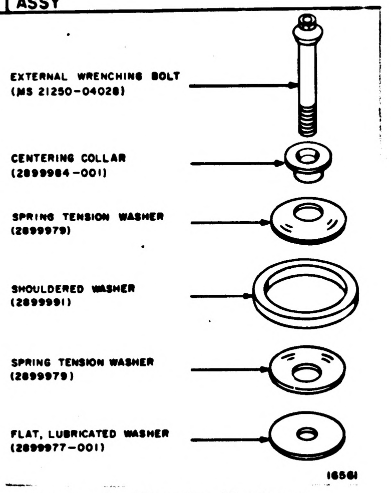

EXTERNAL WRENCHING BOLT (MS 21250-04028)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16561

Figure 2. Mounting Hardware

28. Connect 56P26 of the "E" Harness to 45J7 of the PSA using Gasket (FD770054) between connectors 56P26 and 45J7. Torque the connector screws sequentially to 14 ± 1 inch-pounds.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Connect 56P17 of the "D" Harness to connector GN F J2, on the back wall of the Cradle Assembly using Gasket (FD770054) between connectors 56P17 and GN F J2. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P29 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 3.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

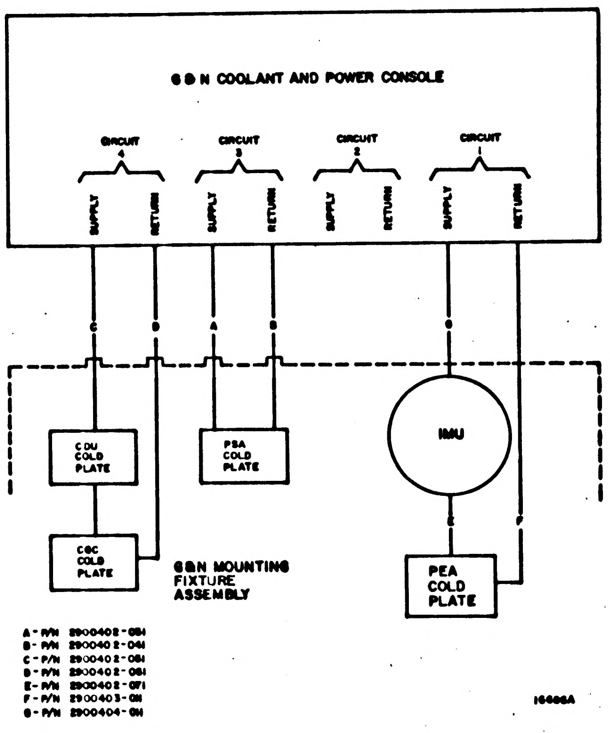


Figure 3.

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF NAV DSKY

50. Position Nav DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect J25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the

G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of grease on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole and insert mounting bolt. Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole and insert mounting bolt. Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 2. Tighten, in numerical sequence, to 27 (±3) inch-pounds in approximately 10 inch-pound increments.

82. Connect 56P33 of the "F" Harness and 56P3 of the "B" Harness to the Optics Assembly. Connect 56P14 of the "B" Harness to 65A1J2 of the Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope. Tighten both eyepieces finger tight.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel

near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

MAIN PANEL DSKY INSTALLATION

87. Position the MAIN DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
Ⓜ A	7-28-66	30300	2, 3, 8, 9, 11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

SUBSYSTEM G & N SYSTEM

ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Grease (G.S. #53087)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 1.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-24) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

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ASSY

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C4-6).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

DATE

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket FD770054 on PSA connector 45J6 and connect harness plug 56P19 to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket FD770054 on PSA connector 45J5 and connect harness plug 56P18 to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket FD770054 on PSA connector 45J10 and connect harness plug 56P29 to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

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23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket FD770054 on PSA connector 45J8 and connett harness plug 56P27 to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

26. Place gasket FD770054 on PSA connector 45J9 and connect harness plug 56P28 to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket FD770054 on PSA connector 45J7 and connect harness plug 56P26 to 45J9 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place a gasket FD770054 on connector GN F J2 (on the back wall of the Cradle Assembly) and connect harness plug 56P17 to GN F J2 as follows:

a. Carefully locate 56P19 on guide pins of GN F J2, ease the harness plug onto

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Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console *		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness	J3	P2	W165
	P21	J4	(2900924)	P7	J2	SCM
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P29 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

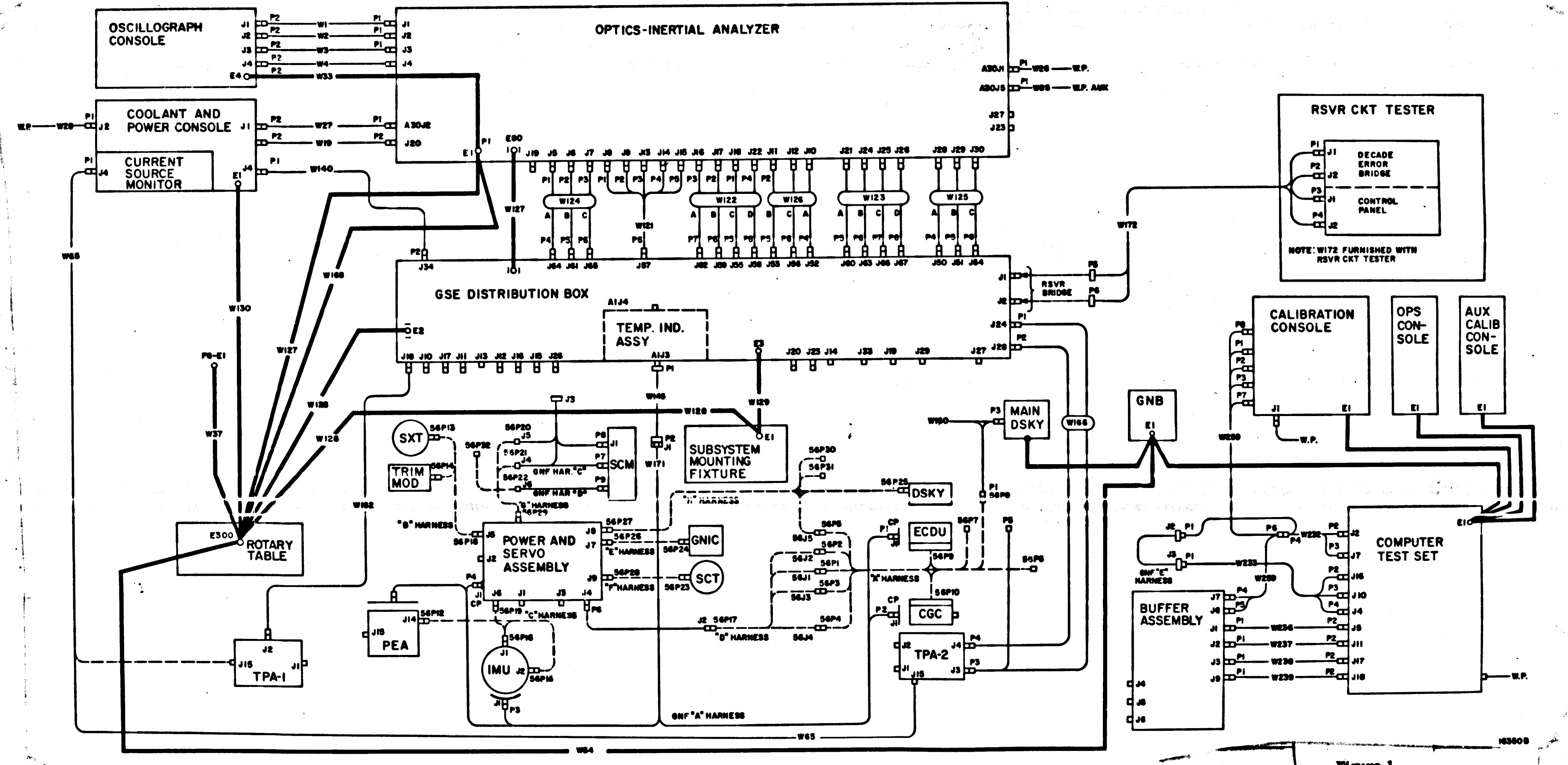
COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 3.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV B PAGE 10 OF 16

SUBSYSTEM G & N SYSTEM | ASSY


OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
RSVR BRIDGE
CALIBRATION CONSOLE
OPS CON-SOLE
AUX CALIB CON-SOLE
GNB
MAIN DSKY
SUBSYSTEM MOUNTING FIXTURE
SXT
TRIM MOD
SCM
DSKY
POWER AND SERVO ASSEMBLY
GNIC
SCT
ECDU
CGC
PEA
IMU
ROTARY TABLE
E300
TPA-1
TPA-2
COMPUTER TEST SET
BUFFER ASSEMBLY
W124
W122
W126
W123
W125
W121
W127
W130
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W168
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Figure 1.

DATE 30 JUN 66

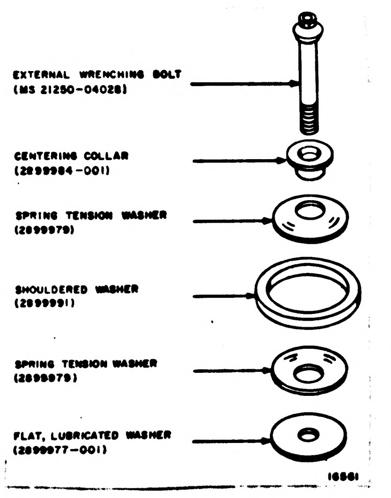
EXTERNAL WRENCHING BOLT (MS 21250-04028)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16861

Figure 2. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF NAV DSKY

50. Position Nav DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect J25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

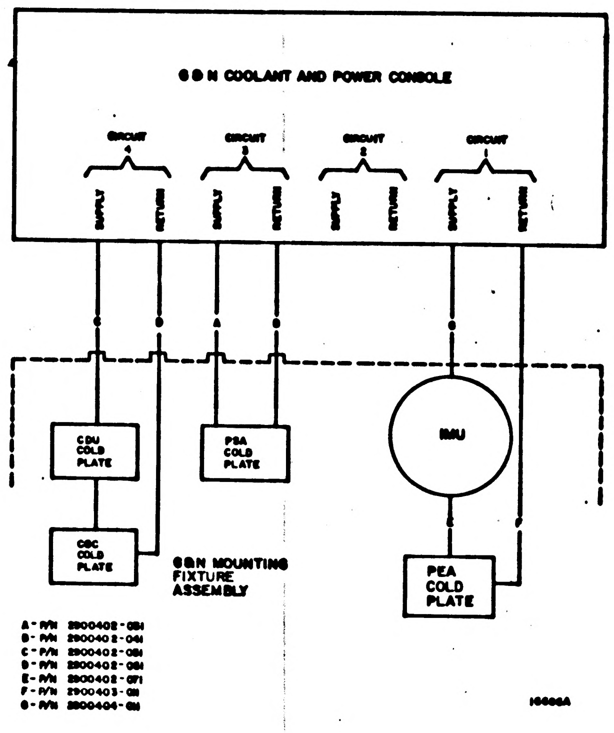

Figure 3.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of grease on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole and insert mounting bolt. Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole and insert mounting bolt. Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

> NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY

> NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 2. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope. Tighten both eyepieces finger tight.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel

near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 56J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

MAIN PANEL DSKY INSTALLATION

87. Position the MAIN DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the MAIN DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV. C PAGE 1 OF 16

INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30300	2, 3, 8, 9, 11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV C PAGE 2 OF 16

SUBSYSTEM G & N SYSTEM

ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Grease (G.S. #53087)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 1.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-24) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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SUBSYSTEM G & N SYSTEM

ASSY

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

DATE

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket FD770054 on PSA connector 45J6 and connect harness plug 56P19 to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket FD770054 on PSA connector 45J5 and connect harness plug 56P18 to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket FD770054 on PSA connector 45J10 and connect harness plug 56P29 to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

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23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket FD770054 on PSA connector 45J8 and connett harness plug 56P27 to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

26. Place gasket FD770054 on PSA connector 45J9 and connect harness plug 56P28 to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket FD770054 on PSA connector 45J7 and connect harness plug 56P26 to 45J9 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place a gasket FD770054 on connector GN F J2 (on the back wall of the Cradle Assembly) and connect harness plug 56P17 to GN F J2 as follows:

a. Carefully locate 56P19 on guide pins of GN F J2, ease the harness plug onto

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Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console *		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCM
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P29 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 3.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

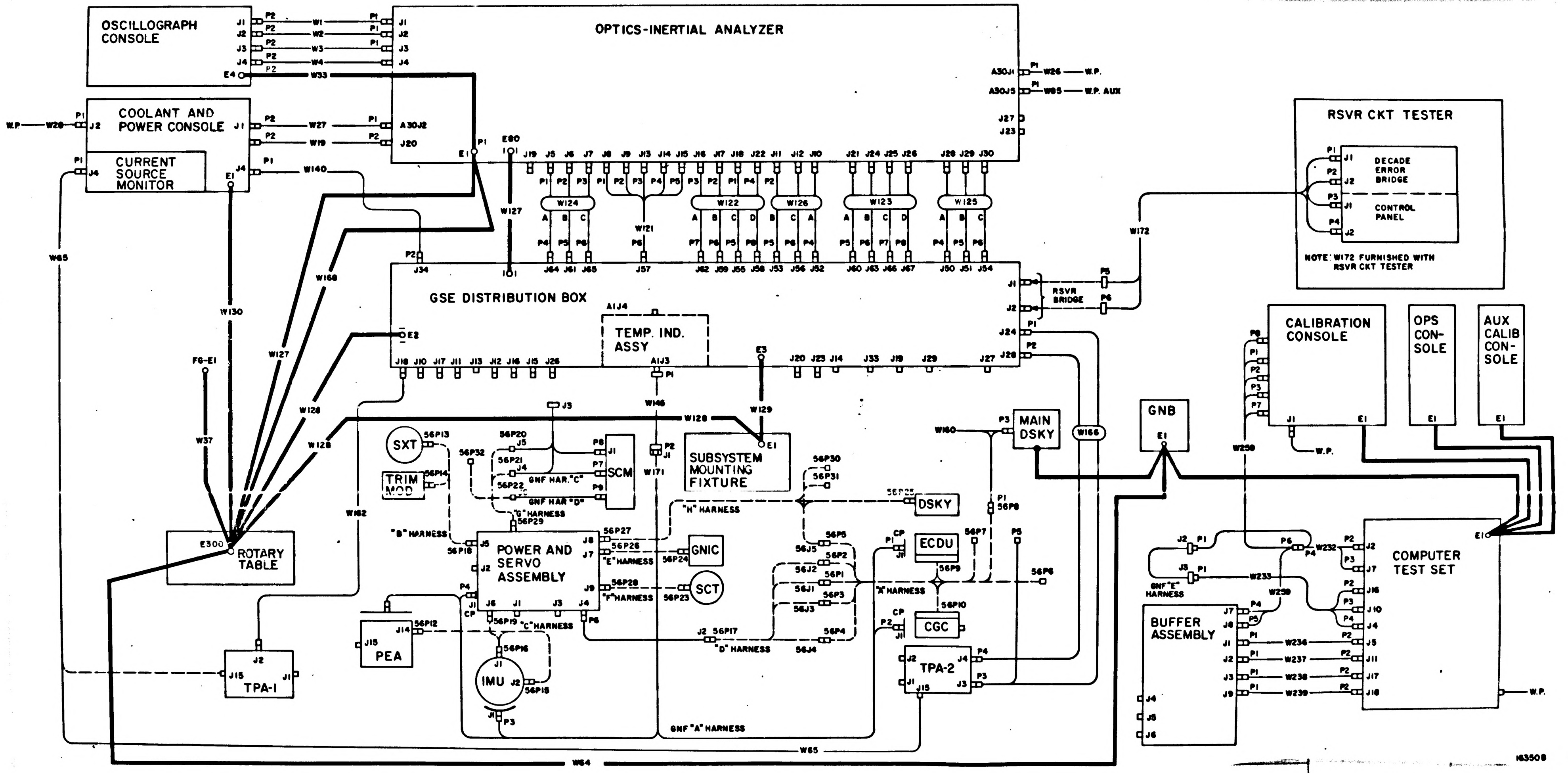
OSCILLOGRAPH CONSOLE
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
OPTICS-INERTIAL ANALYZER
A30J1 P1 W26 W.P.
A30J5 P1 W85 W.P. AUX
W.P. W28
W33
W27
W19
W140
W65
W130
W127
W168
W126
W128
W121
W122
W124
W123
W125
E90
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
A1J4
A1J3
E2
E3
F6-E1
W37
E300
ROTARY TABLE
TPA-1
W162
W146
W129
W171
SUBSYSTEM MOUNTING FIXTURE
SXT
TRIM MOD
SCM
GNF HAR."C"
GNF HAR "D"
"G" HARNESS
"B" HARNESS
POWER AND SERVO ASSEMBLY
"E" HARNESS
"F" HARNESS
"C" HARNESS
"D" HARNESS
"H" HARNESS
"A" HARNESS
GNF "A" HARNESS
GNIC
SCT
PEA
IMU
DSKY
ECDU
CGC
TPA-2
MAIN DSKY
W160
W166
GNB
W172
RSVR BRIDGE
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE
OPS CON-SOLE
AUX CALIB CON-SOLE
W250
W.P.
GNF "E" HARNESS
W232
W233
BUFFER ASSEMBLY
W236
W237
W238
W239
COMPUTER TEST SET
W64
163508

Figure 1.

DATE 30 JUN 66

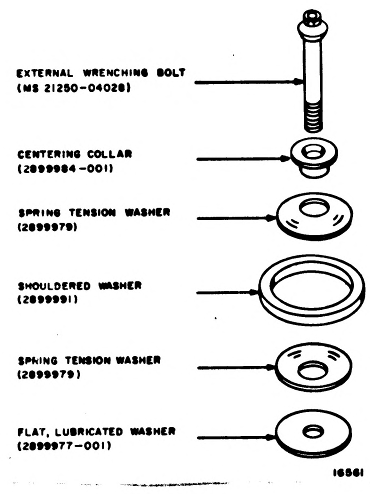
EXTERNAL WRENCHING BOLT (MS 21250-04028)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16561

Figure 2. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect J25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

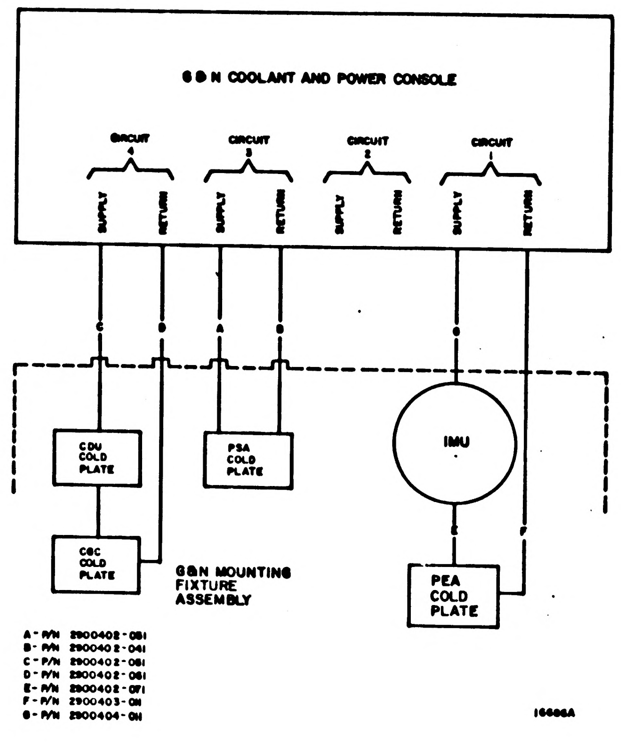

Figure 3.

54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of grease on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole and insert mounting bolt. Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole and insert mounting bolt. Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 2. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope. Tighten both eyepieces finger tight.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel

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near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV. D PAGE 1 OF 16

INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Grease (G.S. #53087)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 1.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

DATE 30 JUN 66

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c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

DATE

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket FD770054 on PSA connector 45J6 and connect harness plug 56P19 to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket FD770054 on PSA connector 45J5 and connect harness plug 56P18 to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket FD770054 on PSA connector 45J10 and connect harness plug 56P29 to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

DATE 30 JUN 66

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV. D PAGE 1 OF 16

INITIAL TDRR 29882 D.S. P-S -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30300	2, 3, 8, 9, 11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV D PAGE 2 OF 16

SUBSYSTEM G & N SYSTEM

ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Grease (G.S. #53087)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 1.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

DATE 30 JUN 66

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV D PAGE 3 OF 16

SUBSYSTEM G & N SYSTEM

ASSY

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

DATE

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV D PAGE 4 OF 16

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket FD770054 on PSA connector 45J6 and connect harness plug 56P19 to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket FD770054 on PSA connector 45J5 and connect harness plug 56P18 to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket FD770054 on PSA connector 45J10 and connect harness plug 56P29 to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

DATE 30 JUN 66

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket FD770054 on PSA connector 45J8 and connect harness plug 56P27 to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

26. Place gasket FD770054 on PSA connector 45J9 and connect harness plug 56P28 to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket FD770054 on PSA connector 45J7 and connect harness plug 56P26 to 45J9 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place a gasket FD770054 on connector GN F J2 (on the back wall of the Cradle Assembly) and connect harness plug 56P17 to GN F J2 as follows:

a. Carefully locate 56P19 on guide pins of GN F J2, ease the harness plug onto

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Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console *		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket FD770054 on PSA connector 45J8 and connett harness plug 56P27 to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

26. Place gasket FD770054 on PSA connector 45J9 and connect harness plug 56P28 to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket FD770054 on PSA connector 45J7 and connect harness plug 56P26 to 45J9 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place a gasket FD770054 on connector GN F J2 (on the back wall of the Cradle Assembly) and connect harness plug 56P17 to GN F J2 as follows:

a. Carefully locate 56P19 on guide pins of GN F J2, ease the harness plug onto

---

Table 1

GSE-GSE Interconnections						
From	**Conn. No.**		**Cable and Drawing No.**	**Conn. No.**		**To**
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections						
From	**Conn. No.**		**Cable and Drawing No.**	**Conn. No.**		**To**
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections						
From	**Conn. No.**		**Cable and Drawing No.**	**Conn. No.**		**To**
CGC Calibration Console *		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness	J3	P2	W165
	P21	J4	(2900924)	P7	J2	SCM
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P29 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 3.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness	J3	P2	W165
	P21	J4	(2900924)	P7	J2	SCM
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P29 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 3.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

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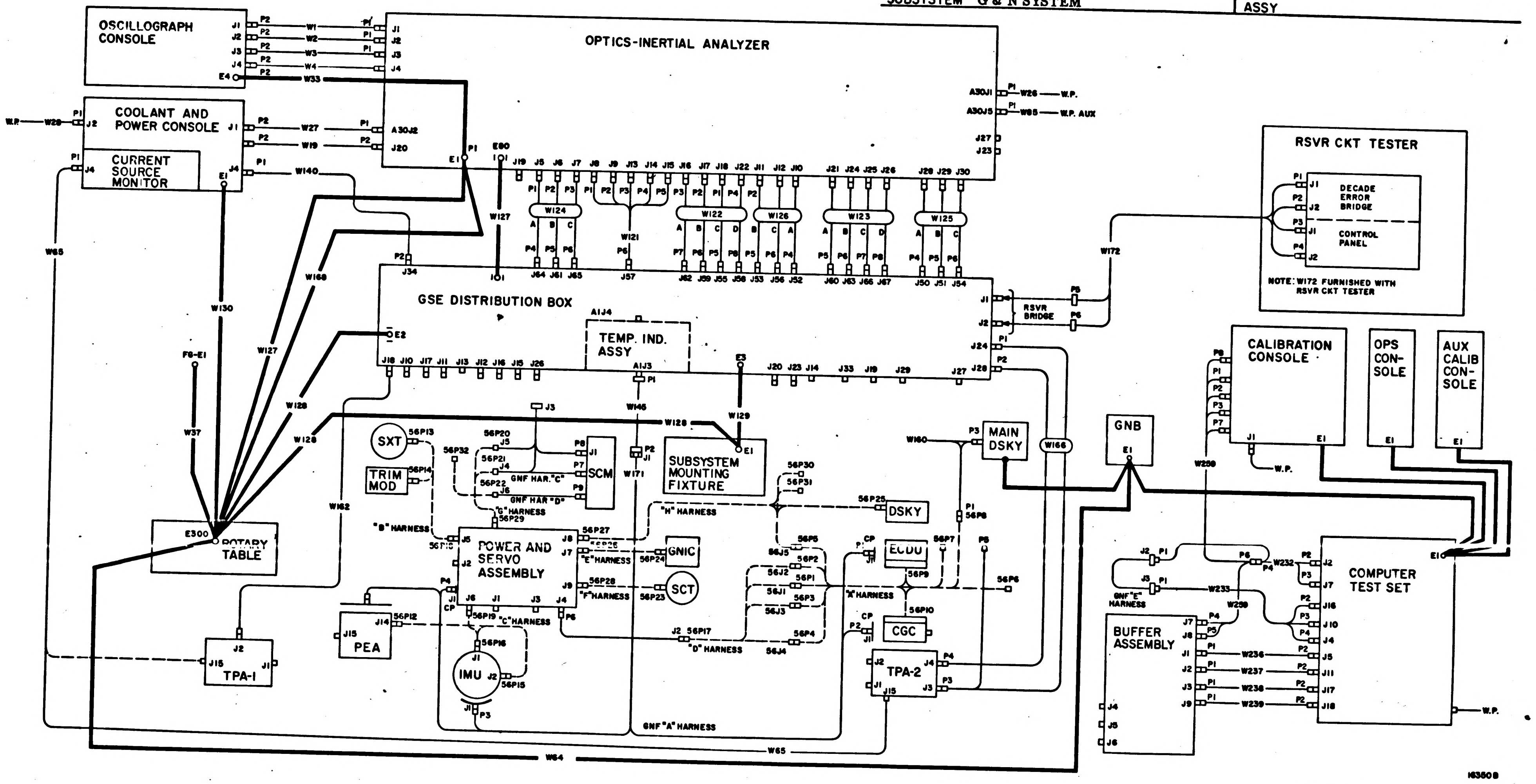
OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
W.P.
W28
W1
W2
W3
W4
W33
W27
W19
W140
A30J1
W26
A30J5
W85
W.P. AUX
E80
W124
W121
W122
W126
W123
W125
W127
W130
W168
W65
W37
F6-E1
GSE DISTRIBUTION BOX
A1J4
TEMP. IND. ASSY
A1J3
E2
E3
RSVR BRIDGE
W172
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE
OPS CON-SOLE
AUX CALIB CON-SOLE
GNB
W146
W129
W128
W162
W171
W160
W166
W250
SXT
TRIM MOD
SCM
GNF HAR. "C"
GNF HAR "D"
"G" HARNESS
"B" HARNESS
"H" HARNESS
"E" HARNESS
"F" HARNESS
"C" HARNESS
"D" HARNESS
"A" HARNESS
GNF "A" HARNESS
GNF "E" HARNESS
SUBSYSTEM MOUNTING FIXTURE
MAIN DSKY
DSKY
POWER AND SERVO ASSEMBLY
GNIC
SCT
ECDU
CGC
PEA
IMU
E300
ROTARY TABLE
TPA-1
TPA-2
BUFFER ASSEMBLY
COMPUTER TEST SET
W232
W233
W236
W237
W238
W239
W64
163508

Figure 1.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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SUBSYSTEM G & N SYSTEM

ASSY

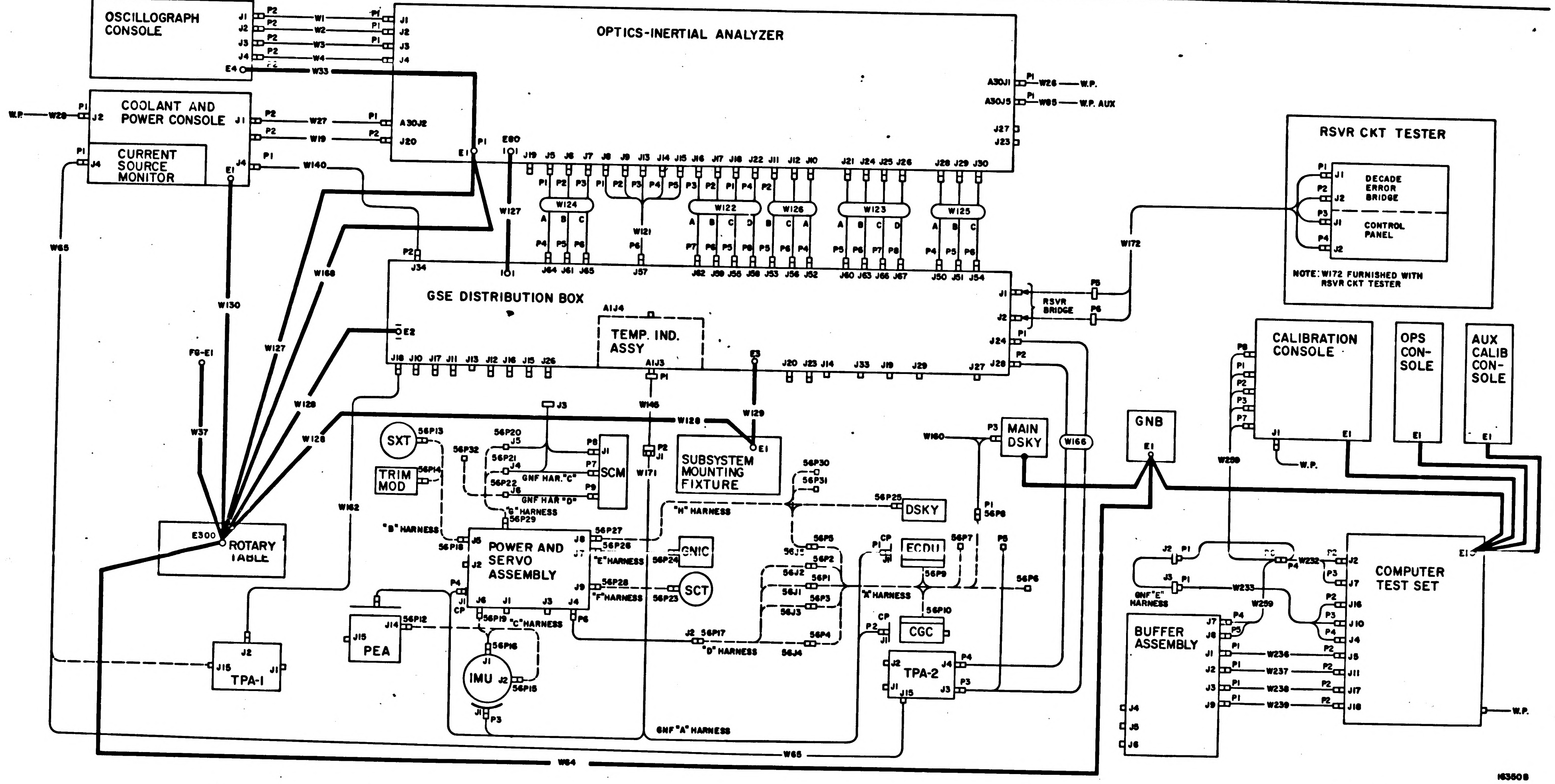
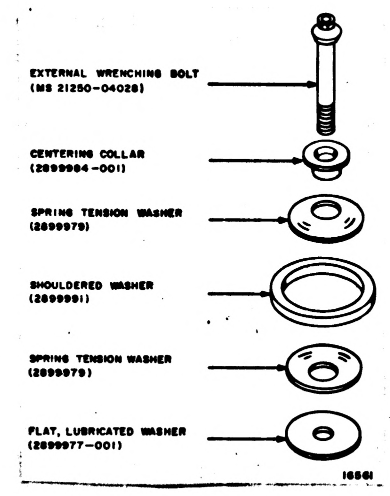

OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
W.P.
W28
W1
W2
W3
W4
W33
W27
W19
W140
W26 W.P.
W65 W.P. AUX
E80
W127
W124
W121
W122
W126
W123
W125
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
A1J4
A1J3
E2
E3
W130
FS-E1
W37
W168
W127
W128
W146
W129
W171
W162
W65
W64
E300
ROTARY TABLE
TPA-1
SXT
TRIM MOD
SCM
GNF HAR. "C"
GNF HAR "D"
"G" HARNESS
"B" HARNESS
"H" HARNESS
SUBSYSTEM MOUNTING FIXTURE
POWER AND SERVO ASSEMBLY
"E" HARNESS
"F" HARNESS
"C" HARNESS
"D" HARNESS
"A" HARNESS
GNF "A" HARNESS
GNIC
SCT
PEA
IMU
DSKY
MAIN DSKY
W160
W166
ECDU
CGC
TPA-2
RSVR BRIDGE
W172
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE
OPS CONSOLE
AUX CALIB CONSOLE
GNB
W259
COMPUTER TEST SET
W232
W233
GNF "E" HARNESS
BUFFER ASSEMBLY
W236
W237
W238
W239
163508

Figure 1.

DATE 30 JUN 66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CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16561

Figure 2. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect J25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

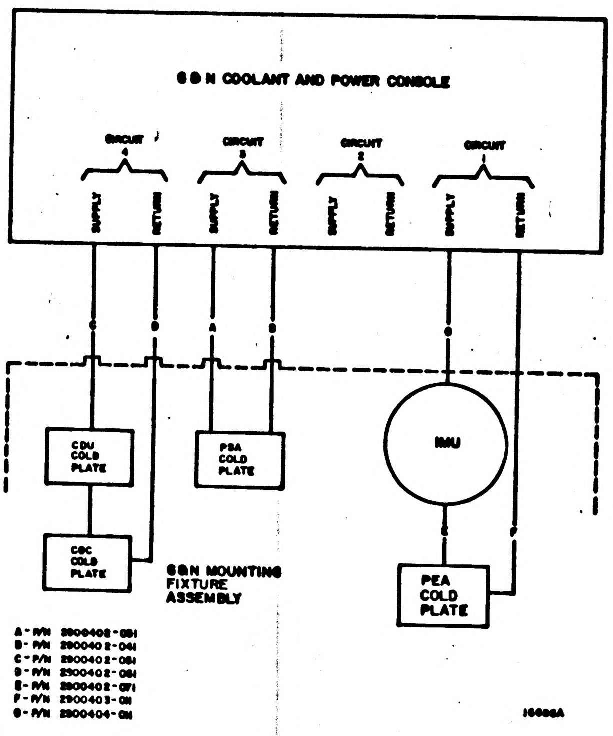

Figure 3.

54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of grease on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

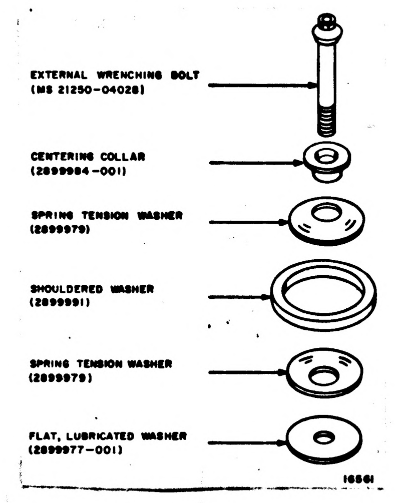
EXTERNAL WRENCHING BOLT (MS 21250-04028)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16561

Figure 2. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect J25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

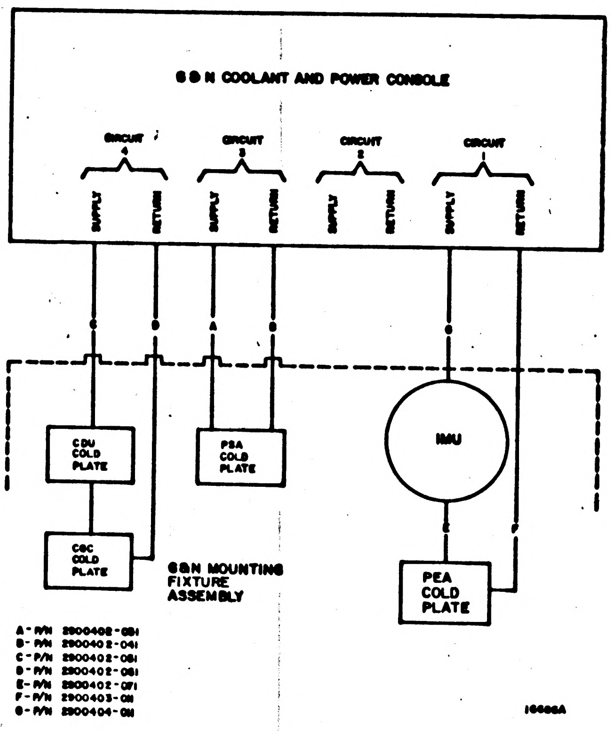

Figure 3.

54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of grease on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole and insert mounting bolt. Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole and insert mounting bolt. Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 2. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope. Tighten both eyepieces finger tight.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel

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near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

69. Remove Plug Gage from the lower left mounting flange hole and insert mounting bolt. Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole and insert mounting bolt. Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 2. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope. Tighten both eyepieces finger tight.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel

near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 **REV.** E **PAGE** 1 **OF** 16

INITIAL TDRR 29882 **D.S. PGS** -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12,15,16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

Performance of this JDC required [illegible] during steps

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Grease (G.S. #53087)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 1.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

DATE 30 JUN 66

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c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C416).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

DATE ______

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket FD770054 on PSA connector 45J6 and connect harness plug 56P19 to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket FD770054 on PSA connector 45J5 and connect harness plug 56P18 to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket FD770054 on PSA connector 45J10 and connect harness plug 56P29 to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

DATE 30 JUN 66

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV. E PAGE 1 OF 16

INITIAL TDRR 29882 D.S. P3S -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

Performance of this JDC requires [illegible] during stage

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV E PAGE 2 OF 16

SUBSYSTEM G & N SYSTEM

ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Grease (G.S. #53087)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 1.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

DATE 30 JUN 66

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV E PAGE 3 OF 16

SUBSYSTEM G & N SYSTEM

ASSY

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

DATE

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV E PAGE 4 OF 16

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket FD770054 on PSA connector 45J6 and connect harness plug 56P19 to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket FD770054 on PSA connector 45J5 and connect harness plug 56P18 to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket FD770054 on PSA connector 45J10 and connect harness plug 56P29 to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

DATE 30 JUN 66

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket FD770054 on PSA connector 45J8 and connett harness plug 56P27 to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

26. Place gasket FD770054 on PSA connector 45J9 and connect harness plug 56P28 to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket FD770054 on PSA connector 45J7 and connect harness plug 56P26 to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place a gasket FD770054 on connector GN F J2 (on the back wall of the Cradle Assembly) and connect harness plug 56P17 to GN F J2 as follows:

a. Carefully locate 56P17 on guide pins of GN F J2, ease the harness plug onto

---

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

[illegible]

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket FD770054 on PSA connector 45J8 and connect harness plug 56P27 to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

26. Place gasket FD770054 on PSA connector 45J9 and connect harness plug 56P28 to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket FD770054 on PSA connector 45J7 and connect harness plug 56P26 to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place a gasket FD770054 on connector GN F J2 (on the back wall of the Cradle Assembly) and connect harness plug 56P17 to GN F J2 as follows:

a. Carefully locate 56P17 on guide pins of GN F J2, ease the harness plug onto

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Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

[illegible]

* [illegible]

** [illegible]

*** [illegible]

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCM
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

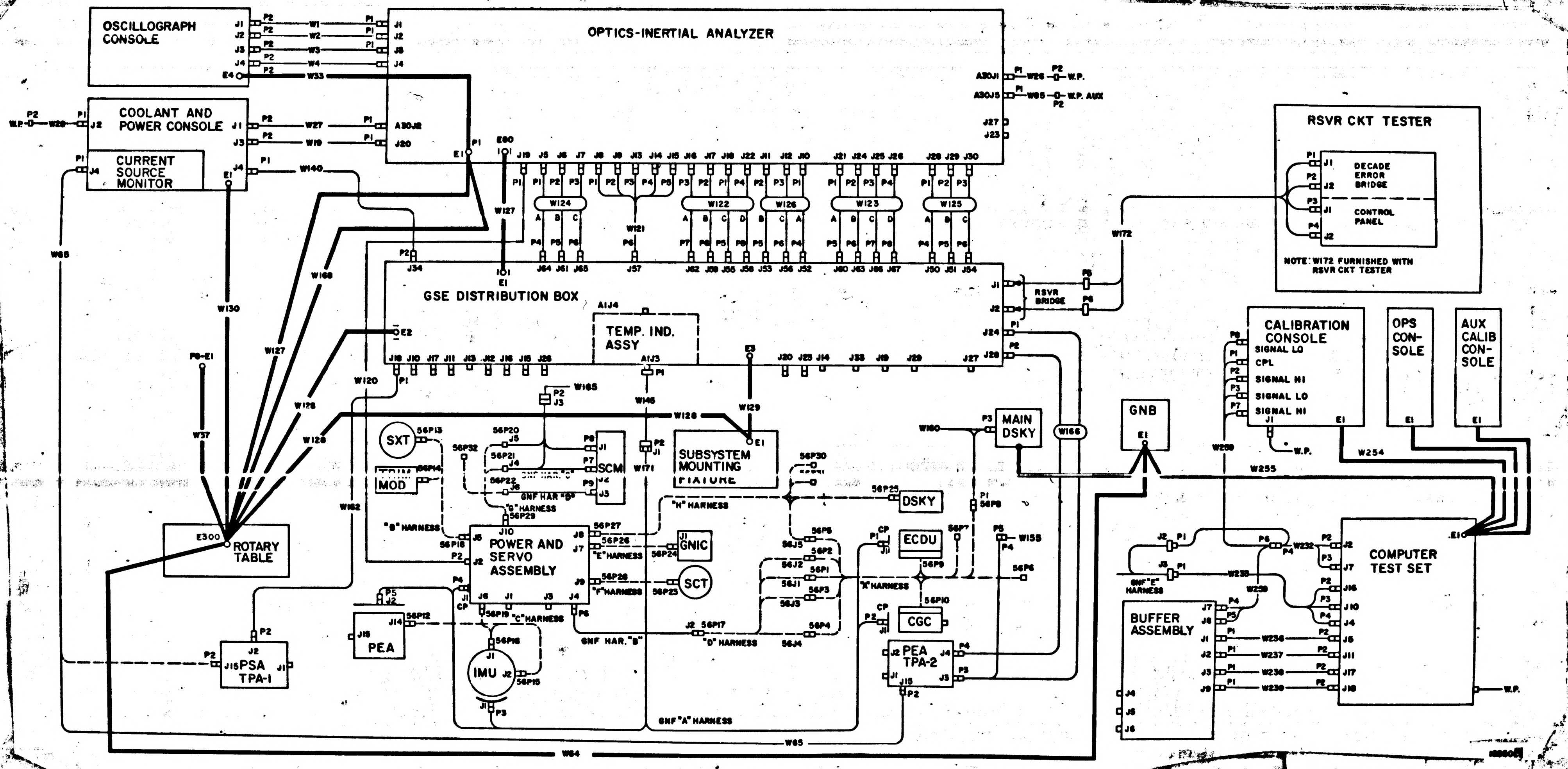
31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 3.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).


OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE
SIGNAL LO
CPL
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CON-SOLE
AUX CALIB CON-SOLE
GNB
MAIN DSKY
DSKY
SUBSYSTEM MOUNTING FIXTURE
SXT
TRIM MOD
SCM
POWER AND SERVO ASSEMBLY
GNIC
SCT
ECDU
CGC
PEA
IMU
PSA TPA-1
PEA TPA-2
ROTARY TABLE
E300
BUFFER ASSEMBLY
COMPUTER TEST SET
W1
W2
W3
W4
W33
W27
W19
W28
W140
W26
W85
W.P.
W.P. AUX
W124
W121
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W126
W123
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W37
W165
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W129
W160
W166
W155
W172
W254
W255
W232
W233
W239
W236
W237
W238
W65
W64
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"F" HARNESS
"G" HARNESS
"H" HARNESS
"X" HARNESS
GNF "A" HARNESS
GNF HAR. "B"
GNF HAR "C"
GNF HAR "D"
GNF "E" HARNESS
P6-E1
E4
E1
E2
E3
E80
A1J4
A1J3
A30J1
A30J2
A30J5
56P13
56P14
56P20
56P21
56P22
56P32
56P29
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56P26
56P24
56P28
56P23
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56P19
56P16
56P15
56P12
56P17
56P30
56P25
56P5
56P2
56P1
56P3
56P4
56P7
56P6
56P8
56P9
56P10
56J5
56J2
56J1
56J3
56J4

Figure 1.

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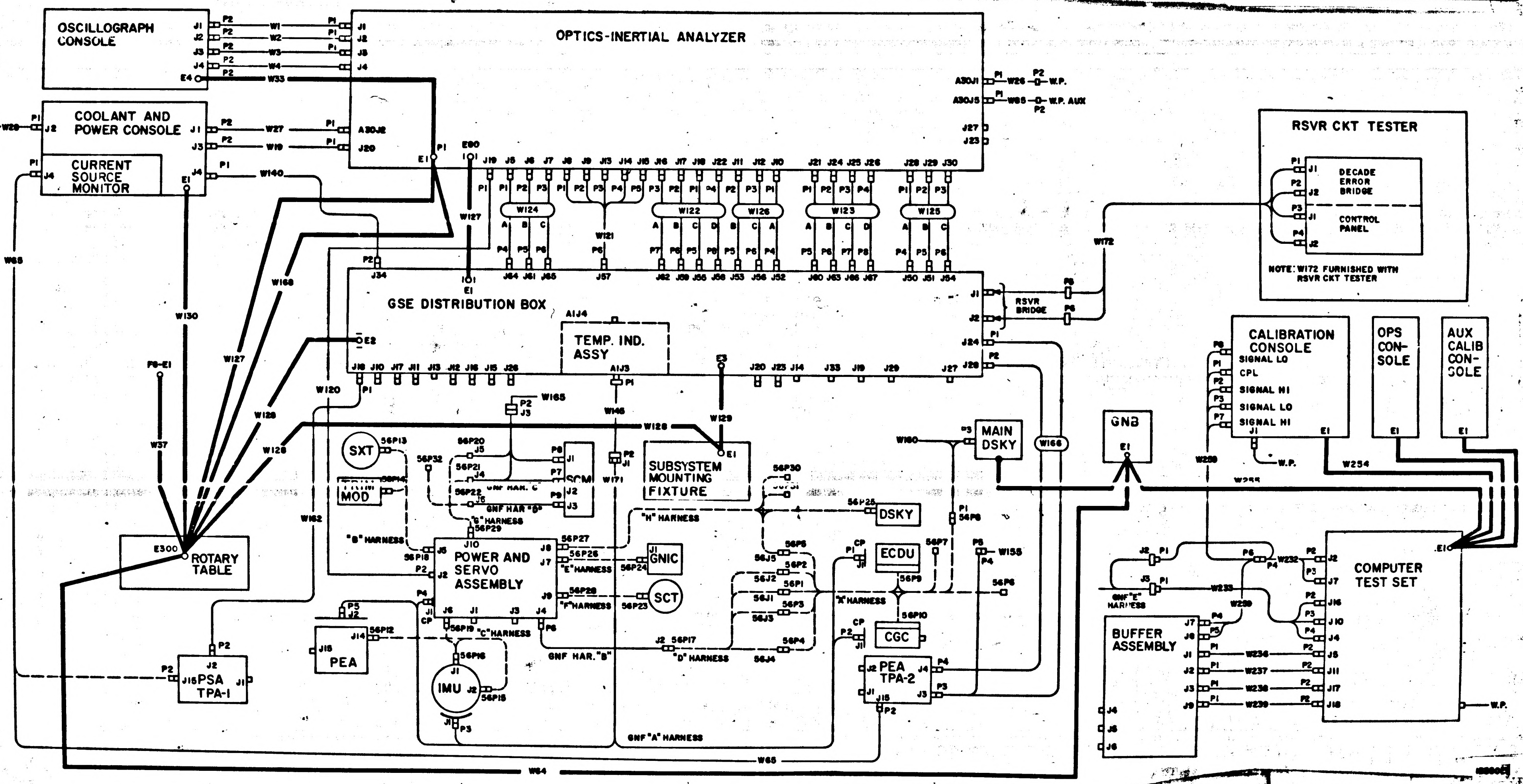
OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
W1
W2
W3
W4
W33
W27
W19
W29
W26
W.P.
W85
W.P. AUX
A30J1
A30J5
A30J2
J20
E80
W124
W121
W122
W126
W123
W125
W127
W140
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W168
W65
W37
W120
W128
W162
W165
W146
W129
W171
J34
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
A1J4
A1J3
E2
E3
RSVR BRIDGE
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
W172
CALIBRATION CONSOLE
SIGNAL LO
CPL
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CON-SOLE
AUX CALIB CON-SOLE
W254
W255
W289
GNB
MAIN DSKY
W160
W166
SXT
MOD
SCM
SUBSYSTEM MOUNTING FIXTURE
DSKY
"H" HARNESS
"G" HARNESS
"B" HARNESS
GNF HAR "D"
POWER AND SERVO ASSEMBLY
"E" HARNESS
"F" HARNESS
GNIC
SCT
"C" HARNESS
GNF HAR. "B"
"D" HARNESS
"A" HARNESS
ECDU
CGC
PEA
IMU
PEA TPA-2
GNF "A" HARNESS
W155
ROTARY TABLE
E300
PSA TPA-1
W64
W65
COMPUTER TEST SET
BUFFER ASSEMBLY
GNF "E" HARNESS
W232
W233
W236
W237
W238
W239
W.P.

Figure 1.

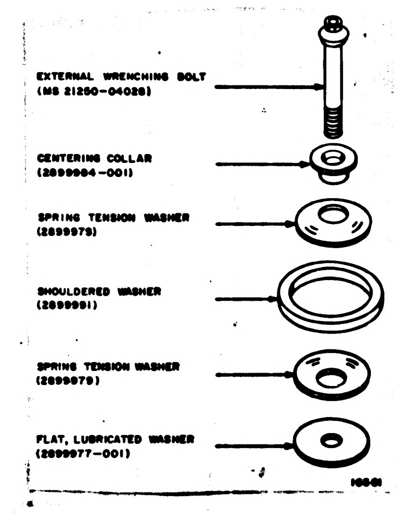

Figure 2. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp. (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in outout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

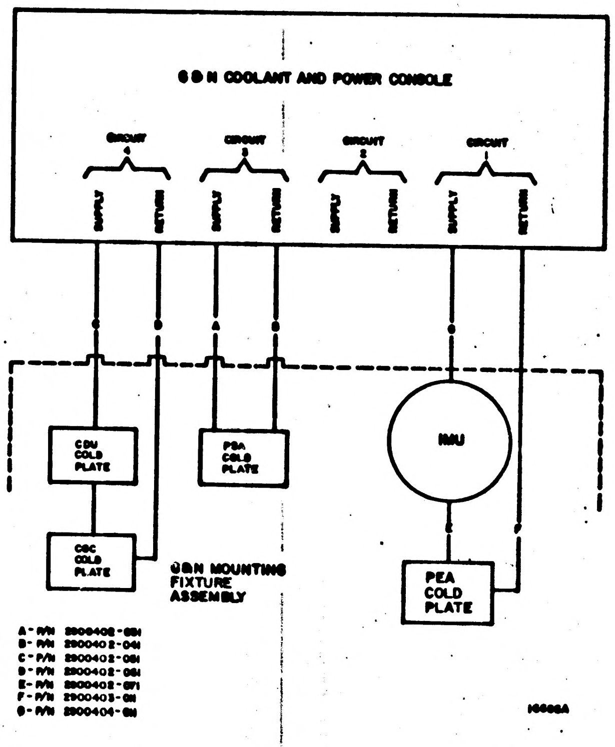

Figure 3.

54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of grease on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

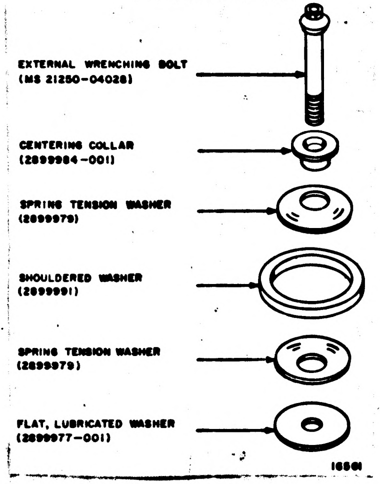
EXTERNAL WRENCHING BOLT (MS 21250-04028)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16561

Figure 2. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp. (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

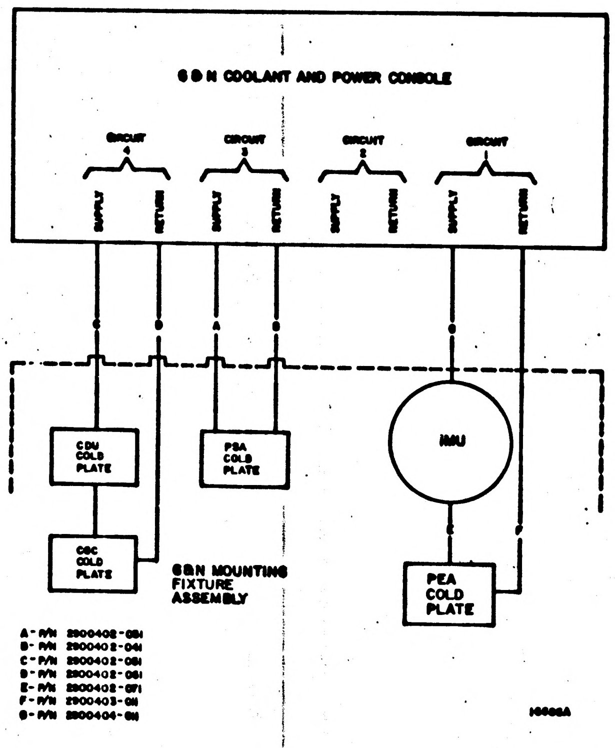

Figure 3.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of grease on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole and insert mounting bolt. Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole and insert mounting bolt. Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 2. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope. Tighten both eyepieces finger tight.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel

near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

69. Remove Plug Gage from the lower left mounting flange hole and insert mounting bolt. Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole and insert mounting bolt. Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 2. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope. Tighten both eyepieces finger tight.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel

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near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV. F PAGE 1 OF 16

INITIAL TDRR 29882 DS PGS -

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-
F	4-27-67	33679	2	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Grease (G.S. #53087)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 1.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

4.A. Install three Fixed Memory Rope Modules and one Fixed Memory Jumper Module in CGC as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

NOTE: Once these modules have been installed, they should remain in the CGC unless replacement is required due to malfunction.

B1 Fixed Memory Rope Module	B2 Fixed Memory Rope Module
B3 Fixed Memory Rope Module	B4 Fixed Memory Jumper Module
B5 Vacant	B6 Vacant

Figure 1.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket FD770054 on PSA connector 45J6 and connect harness plug 56P19 to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket FD770054 on PSA connector 45J5 and connect harness plug 56P18 to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket FD770054 on PSA connector 45J10 and connect harness plug 56P29 to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket FD770054 on PSA connector 45J8 and connett harness plug 56P27 to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

26. Place gasket FD770054 on PSA connector 45J9 and connect harness plug 56P28 to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket FD770054 on PSA connector 45J7 and connect harness plug 56P26 to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E30		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20 P21	J5 J4	GNF "C" Harness (2900924)	J3	P2	W165
				P7	J2	SCM
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place a gasket FD770054 on connector GN F J2 (on the back wall of the Cradle Assembly) and connect harness plug 56P17 to GN F J2 as follows:

a. Carefully locate 56P17 on guide pins of GN F J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

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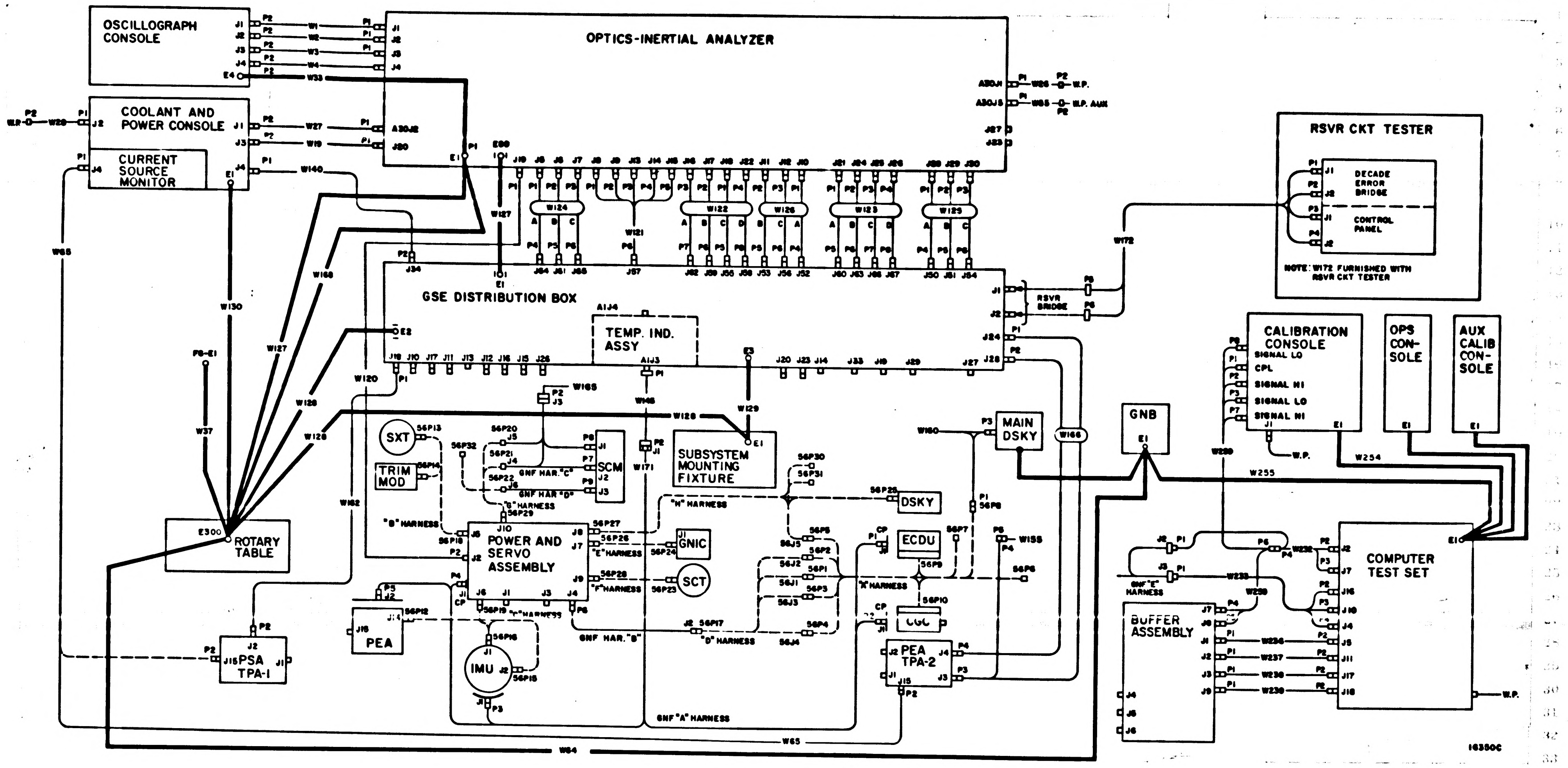
SUBSYSTEM G & N SYSTEM	ASSY


OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
A1J4
A1J3
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE
SIGNAL LO
CPL
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CON-SOLE
AUX CALIB CON-SOLE
GNB
MAIN DSKY
DSKY
ECDU
CGC
SUBSYSTEM MOUNTING FIXTURE
SXT
TRIM MOD
SCM
GNIC
SCT
POWER AND SERVO ASSEMBLY
PEA
IMU
PSA TPA-1
PEA TPA-2
ROTARY TABLE
E300
COMPUTER TEST SET
BUFFER ASSEMBLY
W.P.
W.P. AUX
W1
W2
W3
W4
W33
W27
W19
W28
W140
W26
W85
W127
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W128
W162
W165
W146
W171
W160
W166
W168
W172
W155
W230
W232
W233
W236
W237
W238
W239
W254
W255
"B" HARNESS
"G" HARNESS
"H" HARNESS
"E" HARNESS
"F" HARNESS
"C" HARNESS
"D" HARNESS
"X" HARNESS
GNF HAR. "C"
GNF HAR "D"
GNF HAR. "B"
GNF "A" HARNESS
GNF "E" HARNESS
16350C

Figure 1

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32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 3.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

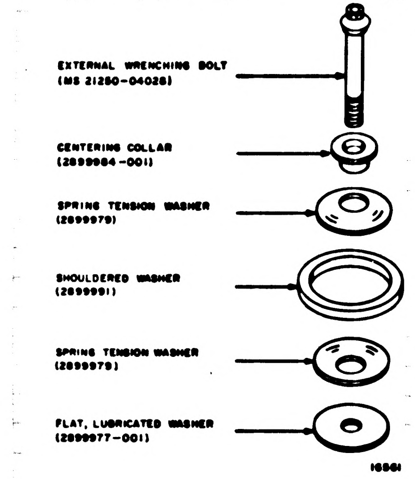
EXTERNAL WRENCHING BOLT (MS 21250-04028)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16961

Figure 2. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

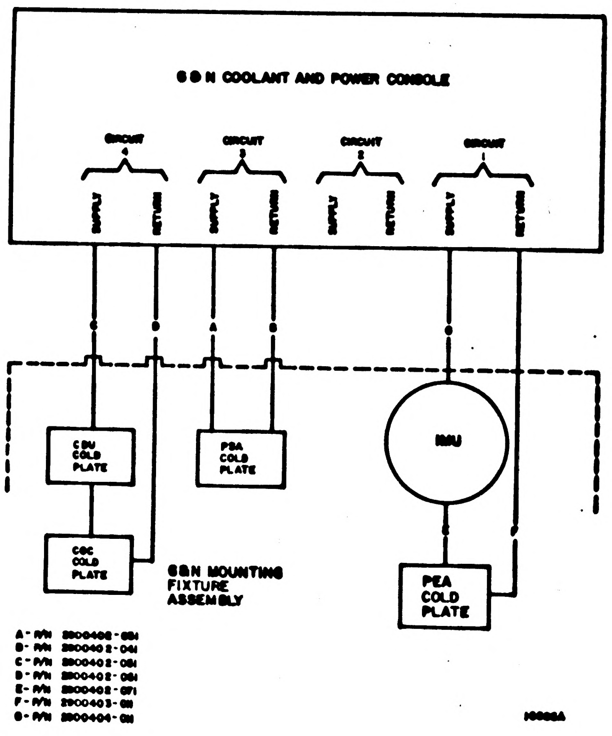

Figure 3.

54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of grease on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole and insert mounting bolt. Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole and insert mounting bolt. Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 2. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope. Tighten both eyepieces finger tight.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel

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near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV. G PAGE 1 OF 16
INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	7-28-66	30300	2, 3, 8, 9, 11	-	EA	WS	
B	9-15-66	31049	2-12, 15, 16	-	EA	-	
C	11-10-66	31883	12, 16	-	EA	-	IMPORTANT See below
D	12-28-66	32472	2	-	JP	-	
E	1-19-67	32682	2, 5, 8-10, 12	-	EA	-	
F	4-27-67	33679	2	-	EA	-	INTERVAL
G	6-6-67	33902	15	-	EA	-	
							TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FO U 00143
Chg. 7-23-65

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV G PAGE 2 OF 16

SUBSYSTEM G & N SYSTEM | ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Grease (G. S. #53087)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 1.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

4.A. Install three Fixed Memory Rope Modules and one Fixed Memory Jumper Module in CGC as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

NOTE: Once these modules have been installed, they should remain in the CGC unless replacement is required due to malfunction.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV G PAGE 3 OF 16

SUBSYSTEM G & N SYSTEM | ASSY

B1 Fixed Memory Rope Module	B2 Fixed Memory Rope Module
B3 Fixed Memory Rope Module	B4 Fixed Memory Jumper Module
B5 Vacant	B6 Vacant

Figure 1.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV G PAGE 4 OF 16

SUBSYSTEM G & N SYSTEM | ASSY

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket FD770054 on PSA connector 45J6 and connect harness plug 56P19 to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket FD770054 on PSA connector 45J5 and connect harness plug 56P18 to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

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22. Place gasket FD770054 on PSA connector 45J10 and connect harness plug 56P29 to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket FD770054 on PSA connector 45J8 and connect harness plug 56P27 to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

26. Place gasket FD770054 on PSA connector 45J9 and connect harness plug 56P28 to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket FD770054 on PSA connector 45J7 and connect harness plug 56P26 to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power
	A30J2	P1	W27 (1900871)	P2	J1	Console
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution
	J5	P1	W124 (2900380)	P4	J64	Box
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution
	J24	P2		P6	J63	Box (Cont.)
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and	J2	P1	W28 (1900872)	P2		Wall power
Power Console	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly
	J11	P2	W237 (2014462-011)	P1	J2	(2014254-011)
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E"
	J10	P3				Harness
	J4	P4				(2900666)
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration		P1	W259 (2014470-011)	P4	J7	Buffer Assembly
Console		P2		P5	J8	(2014254-011)
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness	P1	J1	CDU Coldplate
			(2900753) ***	P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution	J24	P1	W166 (2900671)	P3	J3	PSA TPA
Box	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20 P21	J5 J4	GNF "C" Harness (2900924)	J3	P2	W165
				P7	J2	SCM
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place a gasket FD770054 on connector GN F J2 (on the back wall of the Cradle Assembly) and connect harness plug 56P17 to GN F J2 as follows:

a. Carefully locate 56P17 on guide pins of GN F J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

DATE 30 JUN 66

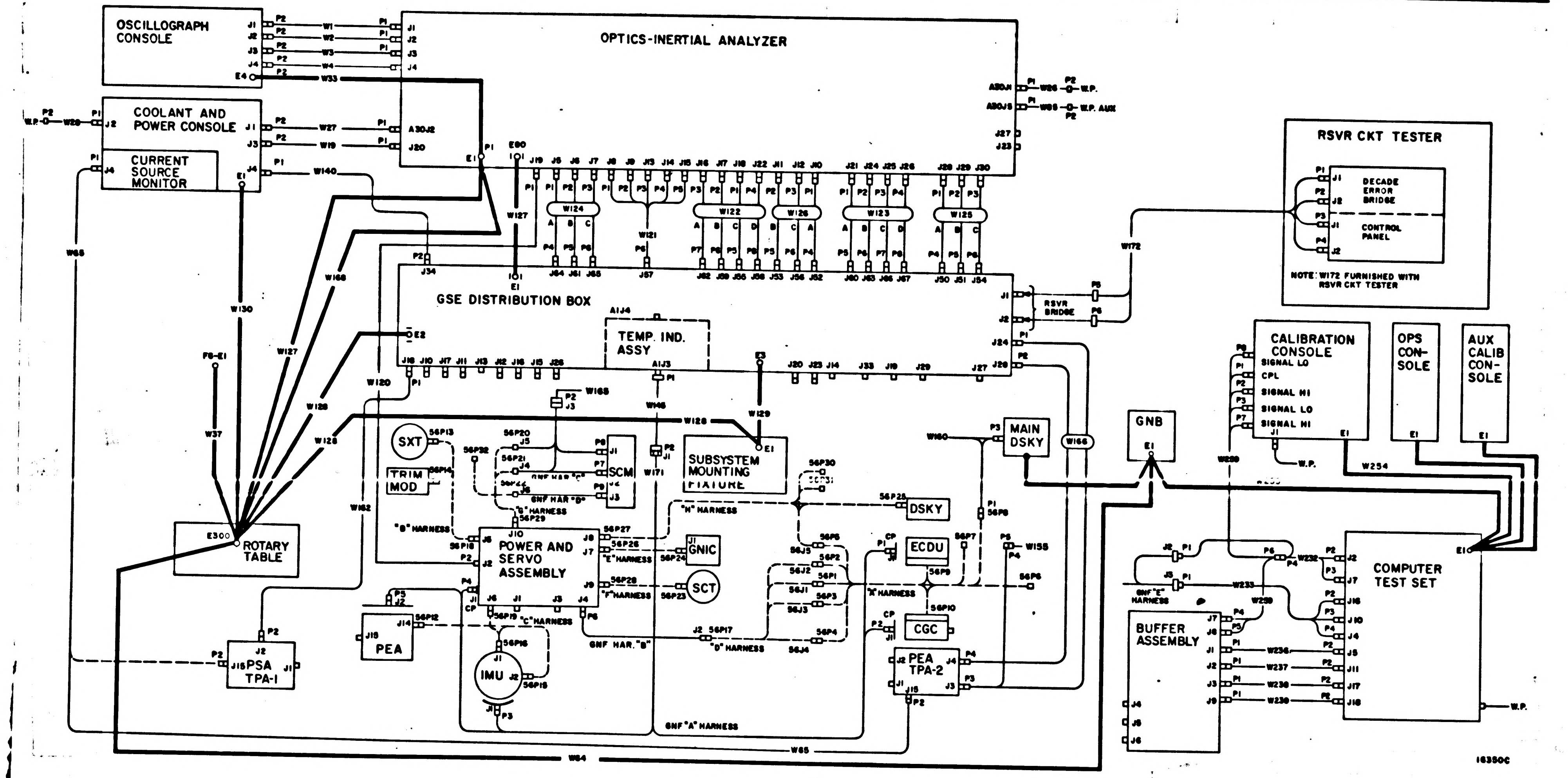
OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
W.P.
W.P. AUX
W1
W2
W3
W4
W33
W27
W19
W28
W140
W65
W130
W168
W127
W128
W120
W162
W37
F8-E1
E80
A30J2
W124
W121
W122
W126
W123
W125
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
A1J4
A1J3
E2
E3
RSVR BRIDGE
W165
W146
W129
W171
W160
W166
W155
W172
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE
SIGNAL LO
CPL
SIGNAL HI
OPS CON-SOLE
AUX CALIB CON-SOLE
GNB
MAIN DSKY
SXT
TRIM MOD
SCM
SUBSYSTEM MOUNTING FIXTURE
DSKY
"B" HARNESS
"G" HARNESS
GNF HAR "C"
GNF HAR "D"
"H" HARNESS
"E" HARNESS
"F" HARNESS
"C" HARNESS
GNF HAR. "B"
"D" HARNESS
"A" HARNESS
GNF "A" HARNESS
GNF "E" HARNESS
ROTARY TABLE
E300
POWER AND SERVO ASSEMBLY
GNIC
SCT
ECDU
CGC
PEA
IMU
PSA TPA-1
PEA TPA-2
W64
W65
W254
W230
W232
W233
W236
W237
W238
BUFFER ASSEMBLY
COMPUTER TEST SET
16350C

Figure 1

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 3.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

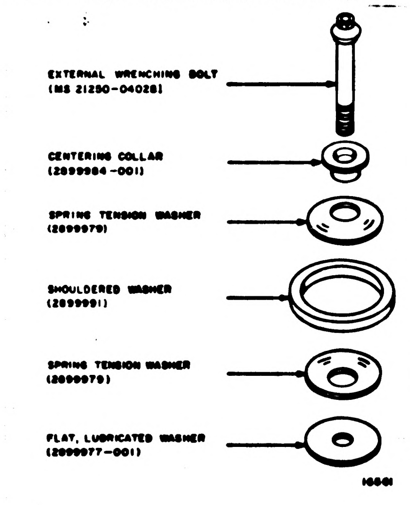
EXTERNAL WRENCHING BOLT (MS 21250-04028)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16661

Figure 2. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

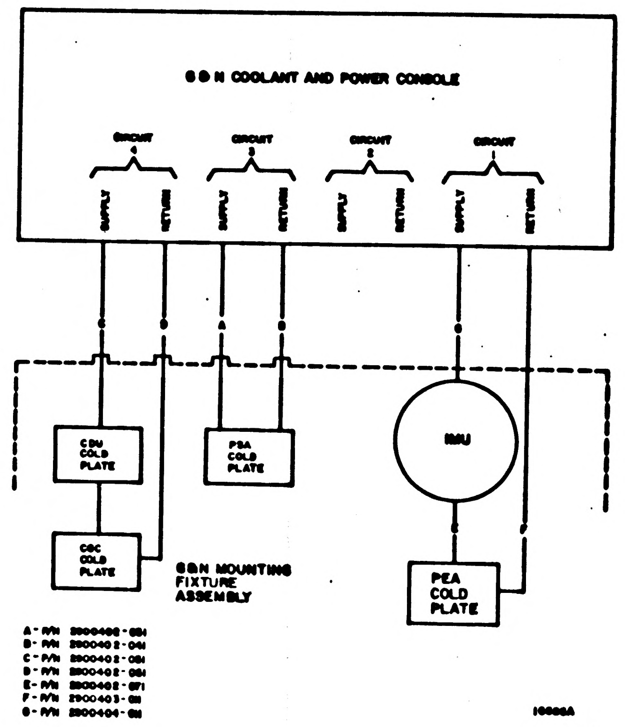

Figure 3.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of grease on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole and insert mounting bolt. Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole and insert mounting bolt. Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 2. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV. H PAGE 1 OF 16

INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	7-28-66	30300	2,3,8,9,11	-	EA	WS	
B	9-15-66	31049	2-12, 15, 16	-	EA	-	
C	11-10-66	31883	12, 16	-	EA	-	IMPORTANT See below
D	12-28-66	32472	2	-	JP	-	
E	1-19-67	32682	2,5,8-10,12	-	EA	-	
F	4-27-67	33679	2	-	EA	-	INTERVAL
G	6-6-67	33902	15	-	EA	-	
H	7-20-67	34174	9,10,14,15	-	SB	-	TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

FORM 00143
Chg. 7-23-65

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Lubricant (MIL M7866) (Alphamolykote type Z NAA Spec MA 0112-02)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

4.A. Install three Fixed Memory Rope Modules and one Fixed Memory Jumper Module in CGC as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

NOTE: Once these modules have been installed, they should remain in the CGC unless replacement is required due to malfunction.

B1 Fixed Memory Rope Module	B2 Fixed Memory Rope Module
B3 Fixed Memory Rope Module	B4 Fixed Memory Jumper Module
B5 Vacant	B6 Vacant

Figure 1.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

---

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket FD770054 on PSA connector 45J6 and connect harness plug 56P19 to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket FD770054 on PSA connector 45J5 and connect harness plug 56P18 to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket FD770054 on PSA connector 45J10 and connect harness plug 56P29 to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket FD770054 on PSA connector 45J8 and connett harness plug 56P27 to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

26. Place gasket FD770054 on PSA connector 45J9 and connect harness plug 56P28 to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket FD770054 on PSA connector 45J7 and connect harness plug 56P26 to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

DATE 30 JUN 66

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

DATE 30 JUN 66

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

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Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

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Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness	J3	P2	W165
	P21	J4	(2900924)	P7	J2	SCM, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place a gasket FD770054 on connector GN F J2 (on the back wall of the Cradle Assembly) and connect harness plug 56P17 to GN F J2 as follows:

a. Carefully locate 56P17 on guide pins of GN F J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

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SUBSYSTEM G & N SYSTEM	ASSY

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

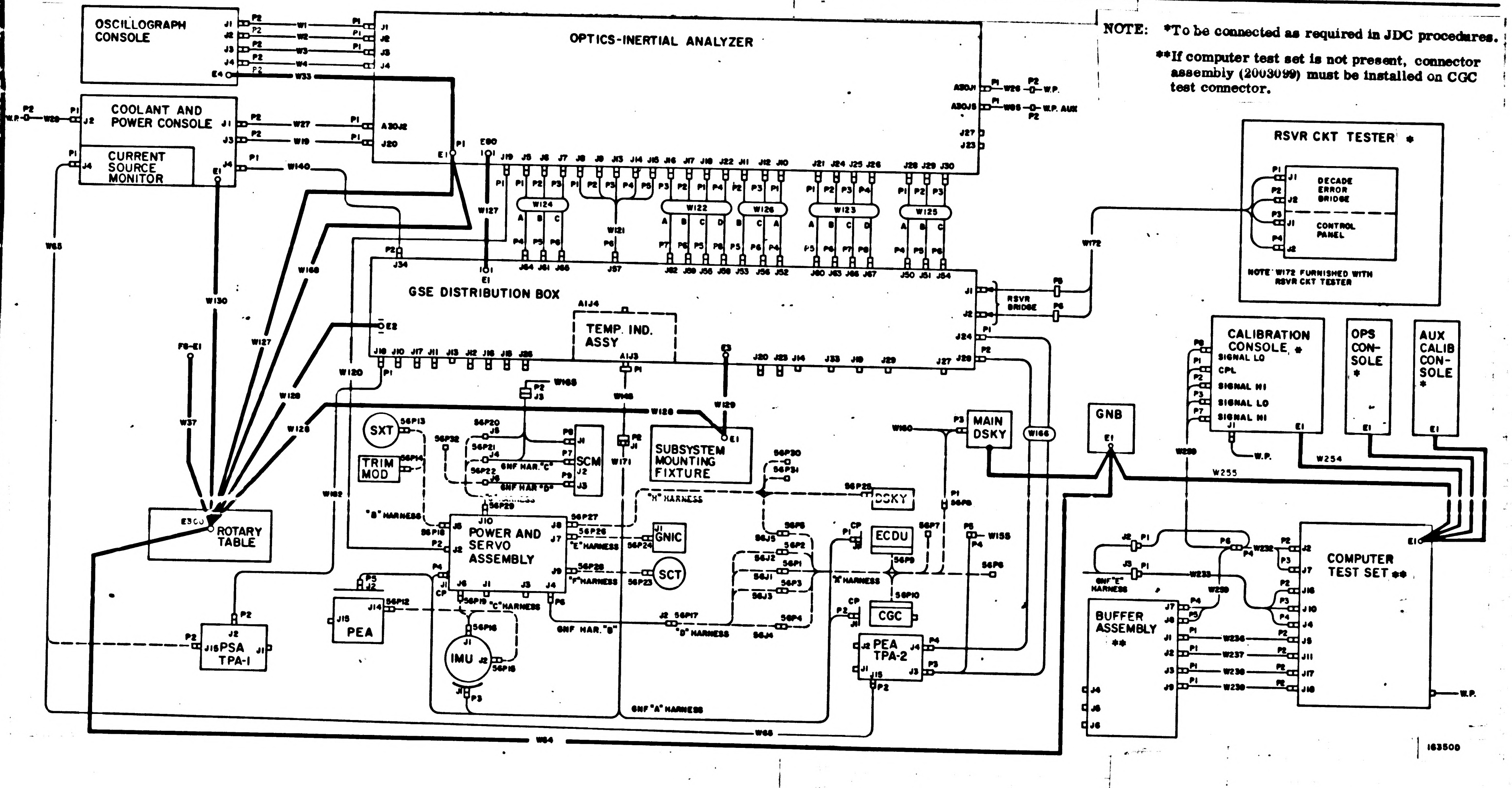
OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CON-SOLE *
AUX CALIB CON-SOLE *
GNB
MAIN DSKY
DSKY
SXT
TRIM MOD
SCM
SUBSYSTEM MOUNTING FIXTURE
ROTARY TABLE
POWER AND SERVO ASSEMBLY
GNIC
SCT
ECDU
CGC
PEA
IMU
PSA TPA-1
PEA TPA-2
BUFFER ASSEMBLY **
COMPUTER TEST SET **
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"F" HARNESS
"H" HARNESS
GNF "A" HARNESS
GNF HAR. "B"
GNF HAR. "C"
GNF HAR "D"
W.P.
W.P. AUX
W64
W65
W127
W128
W129
W130
W140
W155
W166
W172
W254
W255
163500

Figure 2

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32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

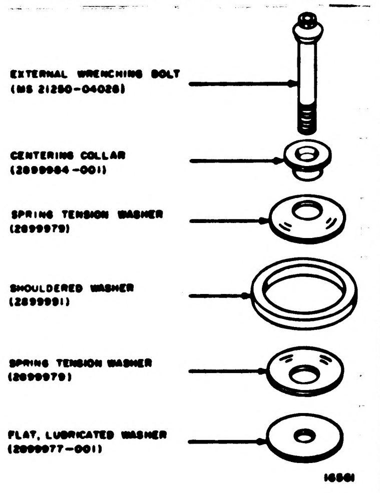
EXTERNAL WRENCHING BOLT (MS 21250-04026)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899981)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16561

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

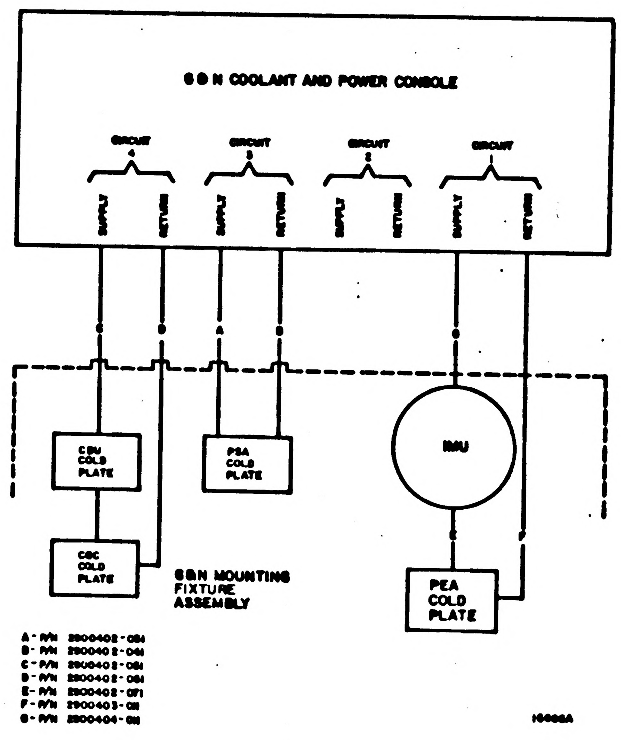

Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of lubricant (MIL M7866) on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

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82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV. J PAGE 1 OF 16
INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	7-28-66	30300	2,3,8,9,11	-	EA	WS	
B	9-15-66	31049	2-12, 15, 16	-	EA	-	
C	11-10-66	31883	12, 16	-	EA	-	IMPORTANT See below
D	12-28-66	32472	2	-	JP	-	
E	1-19-67	32682	2,5,8-10,12	-	EA	-	
F	4-27-67	33679	2	-	EA	-	INTERVAL
G	6-6-67	33902	15	-	EA	-	
H	7-20-67	34174	9,10,14,15	-	SB	-	TOOLS AND MATERIAL See below
J	8-24-67	34432	2, 4, 5, 6, 8,9,10,16		EA		

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM 00143
Chg 7-23-65

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Lubricant (MIL M7866) (Alphamolykote type Z NAA Spec MA 0112-02)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

4.A. Install three Fixed Memory Rope Modules and one Fixed Memory Jumper Module in CGC as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

NOTE: Once these modules have been installed, they should remain in the CGC unless replacement is required due to malfunction.

B1 Fixed Memory Rope Module	B2 Fixed Memory Rope Module
B3 Fixed Memory Rope Module	B4 Fixed Memory Jumper Module
B5 Vacant	B6 Vacant

Figure 1.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15	PSA TPA
					or	
					J15	PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCM, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

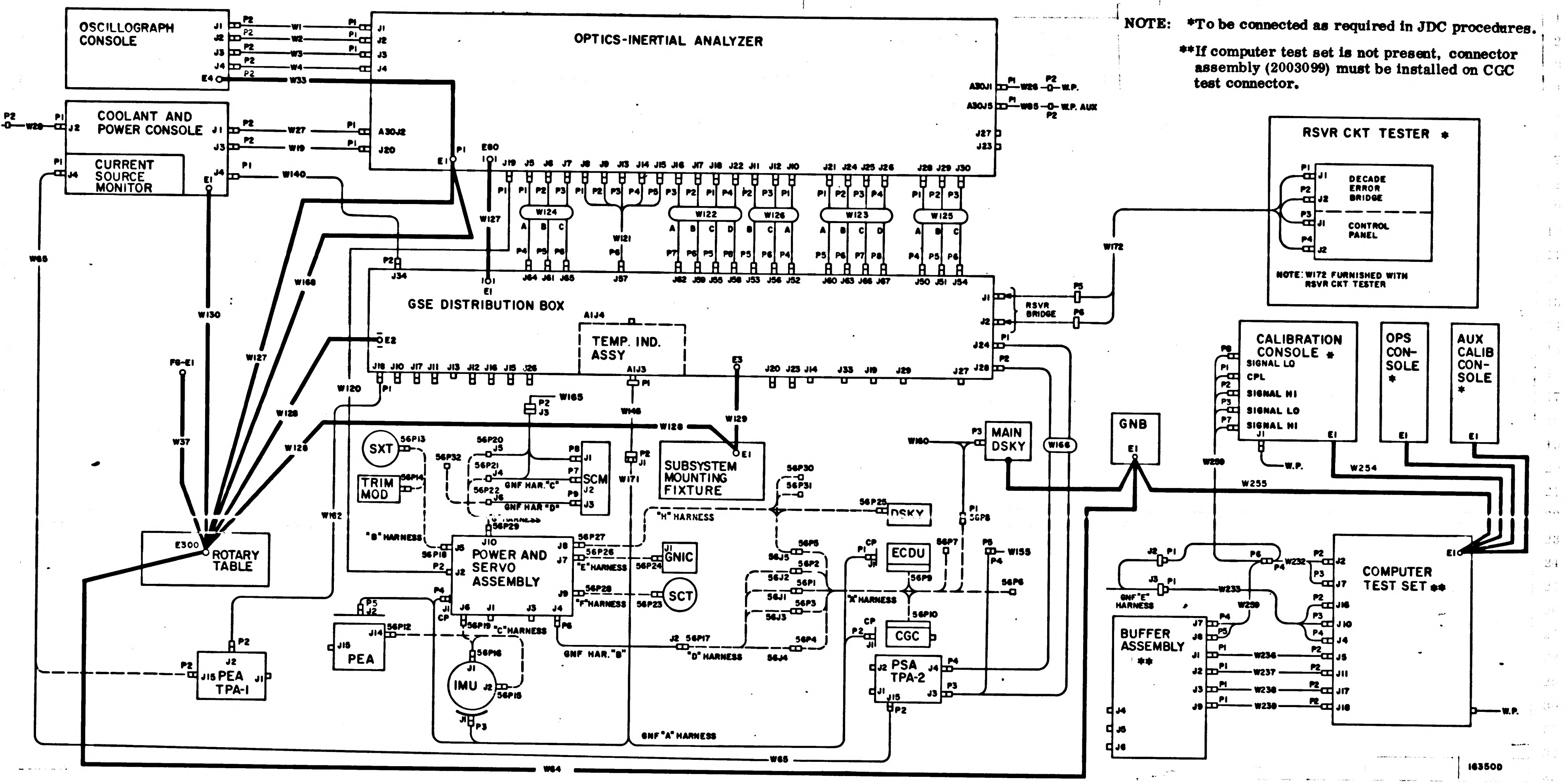
OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CON-SOLE *
AUX CALIB CON-SOLE *
GNB
MAIN DSKY
DSKY
ECDU
CGC
PSA TPA-2
COMPUTER TEST SET **
BUFFER ASSEMBLY **
SUBSYSTEM MOUNTING FIXTURE
SXT
TRIM MOD
SCM
POWER AND SERVO ASSEMBLY
GNIC
SCT
PEA
IMU
PEA TPA-1
ROTARY TABLE
E300
FG-E1
W.P.
W.P. AUX
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"F" HARNESS
"H" HARNESS
"A" HARNESS
GNF HAR. "B"
GNF HAR. "C"
GNF HAR "D"
GNF "A" HARNESS
GNF "E" HARNESS
W1
W2
W3
W4
W26
W27
W28
W19
W33
W37
W64
W65
W95
W120
W121
W122
W123
W124
W125
W126
W127
W128
W129
W130
W140
W146
W155
W160
W162
W165
W166
W168
W171
W172
W232
W233
W236
W237
W238
W239
W254
W255
W259
163500

Figure 2

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

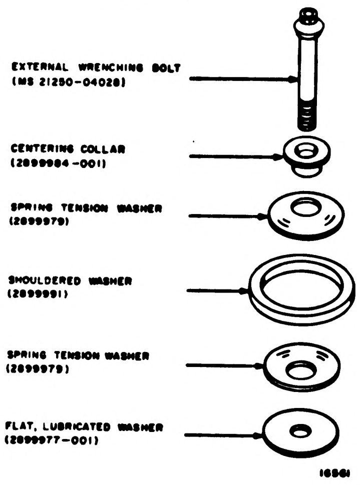
EXTERNAL WRENCHING BOLT (MS 21250-04028)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16861

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

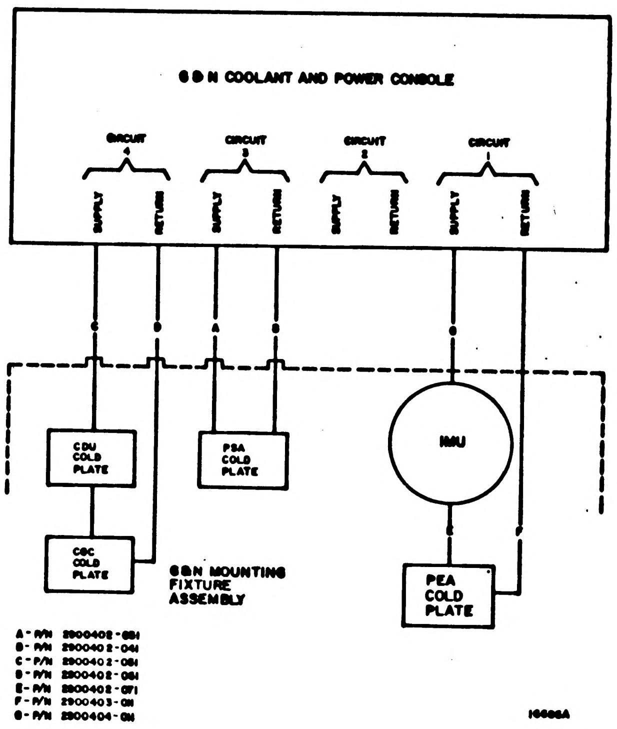

Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of lubricant (MIL M7866) on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

> NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

> NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.
>
> Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

> NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

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82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

> NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV. K PAGE 1 OF 16
INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	7-28-66	30300	2,3,8,9,11	-	EA	WS	
B	9-15-66	31049	2-12, 15, 16	-	EA	-	
C	11-10-66	31883	12, 16	-	EA	-	IMPORTANT See below
D	12-28-66	32472	2	-	JP	-	
E	1-19-67	32682	2,5,8-10,12	-	EA	-	
F	4-27-67	33679	2	-	EA	-	INTERVAL
G	6-6-67	33902	15	-	EA	-	
H	7-20-67	34174	9,10,14,15	-	SB	-	TOOLS AND MATERIAL See below
J	8-24-67	34432	2, 4, 5, 6, 8,9,10,16		EA		
K	10-12-67	34848	2, 3	-	EA	-	

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Lubricant (MIL M7866) (Alphamolykote type Z NAA Spec MA 0112-02)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

4A. Install three fixed memory rope modules and either one or three jumper modules in CGC as specified on Drawing 2021104 and as shown on Figure 1. Tighten screws on modules to 15-19 in-lbs.

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B1 Fixed Memory Rope Module	B2 Fixed Memory Rope Module
B3 Fixed Memory Rope Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

Figure 1.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-323).

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22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. Nc.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCM, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

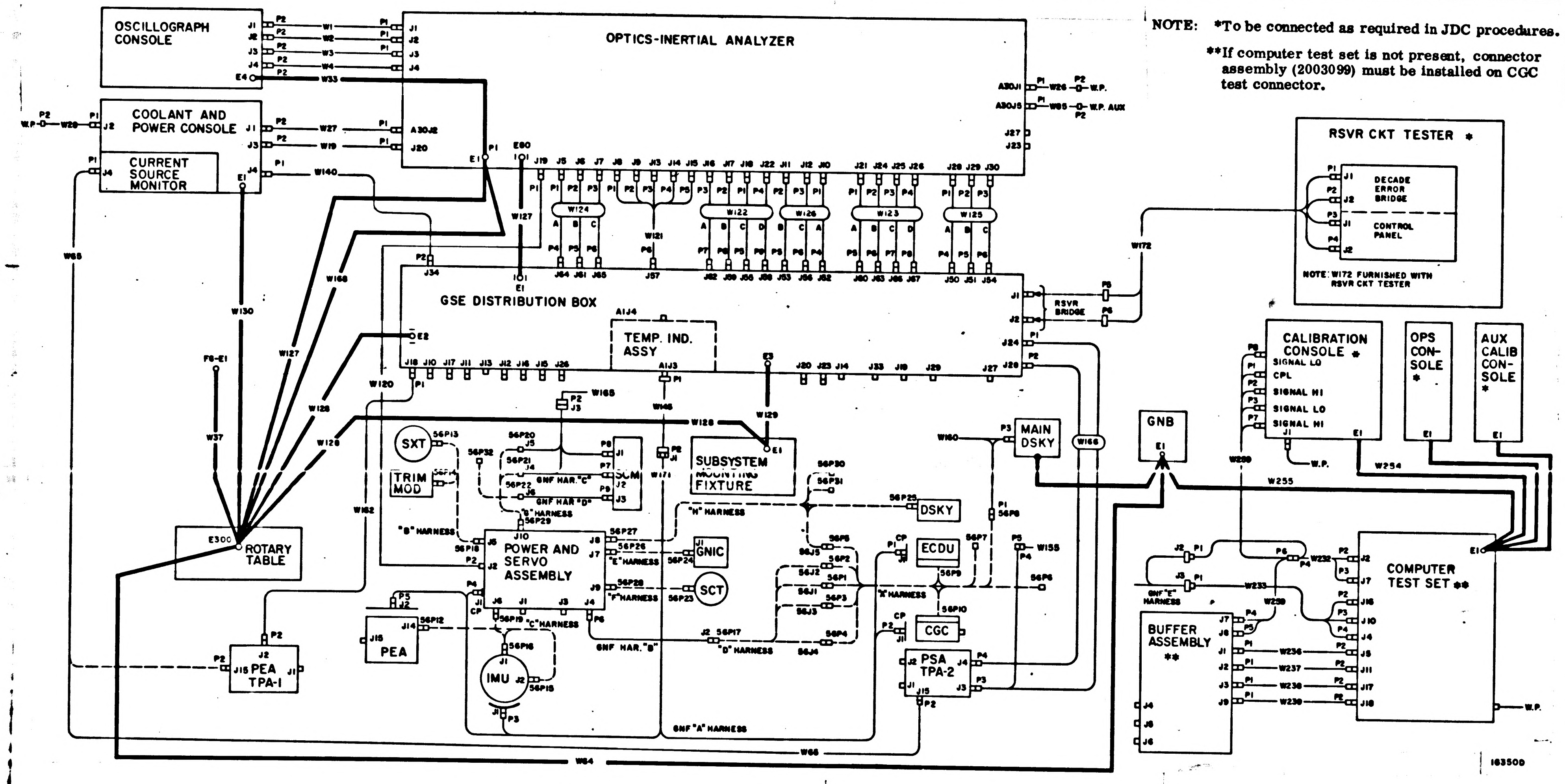
OSCILLOGRAPH CONSOLE
J1
J2
J3
J4
E4
W1
W2
W3
W4
W33
OPTICS-INERTIAL ANALYZER
A30J1
W26
W.P.
A30J5
W85
W.P. AUX
J27
J23
COOLANT AND POWER CONSOLE
W.P.
W29
W27
W19
A30J2
J20
CURRENT SOURCE MONITOR
W140
E80
J19 J5 J6 J7 J8 J9 J13 J14 J15 J16 J17 J18 J22 J11 J12 J10
J21 J24 J25 J26
J28 J29 J30
W124
W121
W122
W126
W123
W125
W127
J34
J64 J61 J65
J57
J62 J59 J56 J58 J53 J66 J52
J60 J63 J66 J67
J50 J51 J54
GSE DISTRIBUTION BOX
E1
E2
RSVR BRIDGE
J24
J28
A1J4
TEMP. IND. ASSY
A1J3
E3
J18 J10 J17 J11 J13 J12 J16 J15 J26
J20 J23 J14 J33 J19 J29 J27
W65
W130
F6-E1
W37
W127
W168
W128
W120
W126
W162
W165
W146
W129
W171
E300
ROTARY TABLE
SXT
TRIM MOD
SCM
56P13
56P20
56P21
56P22
56P32
GNF HAR "C"
GNF HAR "D"
"G" HARNESS
56P29
SUBSYSTEM MOUNTING FIXTURE
"B" HARNESS
56P18
POWER AND SERVO ASSEMBLY
J10
J5
J2
J8
J7
J9
J6
J1
J3
J4
56P27
56P26
"E" HARNESS
56P24
GNIC
56P28
"F" HARNESS
56P23
SCT
"H" HARNESS
56P30
56P31
56P25
DSKY
W160
MAIN DSKY
W166
P1
56P8
56P7
W155
56P6
ECDU
56P9
"A" HARNESS
56P10
CGC
56P5
56J5
56P2
56J2
56P1
56J1
56P3
56J3
56P4
56J4
56P17
"D" HARNESS
GNF HAR. "B"
56P19
"C" HARNESS
56P16
IMU
56P15
PEA
J14
J15
56P12
PEA TPA-1
PSA TPA-2
GNF "A" HARNESS
W64
W66
GNB
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
W172
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CON-SOLE *
AUX CALIB CON-SOLE *
W280
W254
W255
COMPUTER TEST SET **
W232
W233
W239
GNF "E" HARNESS
BUFFER ASSEMBLY **
W236
W237
W238
W239
W.P.
163500

Figure 2

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32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

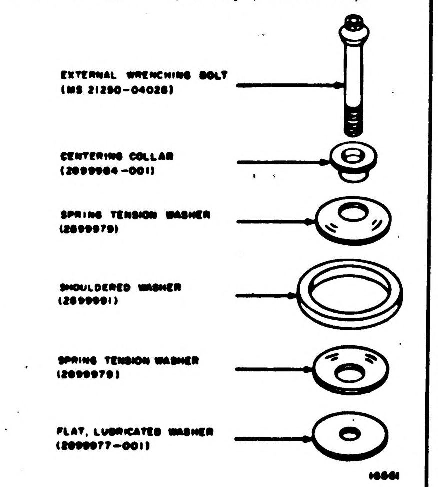

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

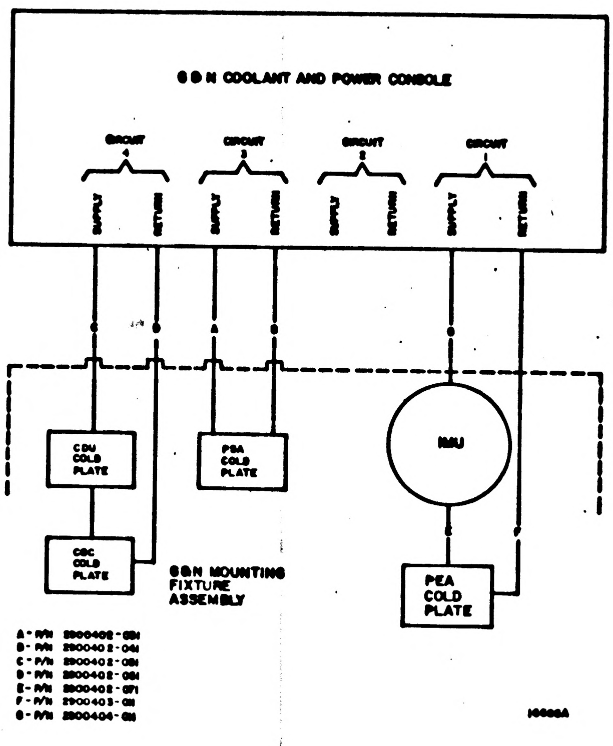

Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of lubricant (MIL M7866) on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs. Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

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82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV. L PAGE 1 OF 16
INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-
F	4-27-67	33679	2	-	EA	-
G	6-6-67	33902	15	-	EA	-
H	7-20-67	34174	9,10,14,15	-	SB	-
J	8-24-67	34432	2, 4, 5, 6, 8,9,10,16		EA	
K	10-12-67	34848	2, 3	-	EA	-
L	11-9-67	35032	3,7,9,10	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM 00143
Chg. 1-23-65

JOB G & N SYSTEM FOR TESTING | JDC 12201 REV L PAGE 2 OF 16

SUBSYSTEM G & N SYSTEM | ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Lubricant (MIL M7866) (Alphamolykote type Z NAA Spec MA 0112-02)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

4A. Install three fixed memory rope modules and either one or three jumper modules in CGC as specified on Drawing 2021104 and as shown on Figure 1. Tighten screws on modules to 15-19 in-lbs.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV L PAGE 3 OF 16

SUBSYSTEM G & N SYSTEM | ASSY

B1 Fixed Memory Module	B2 Fixed Memory Module
B3 Fixed Memory Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

Figure 1.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

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22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458) (2 required)			
Subsystem Mounting Fixture	E1					
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness	J3	P2	W165
	P21	J4	(2900924)	P7	J2	SCA, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

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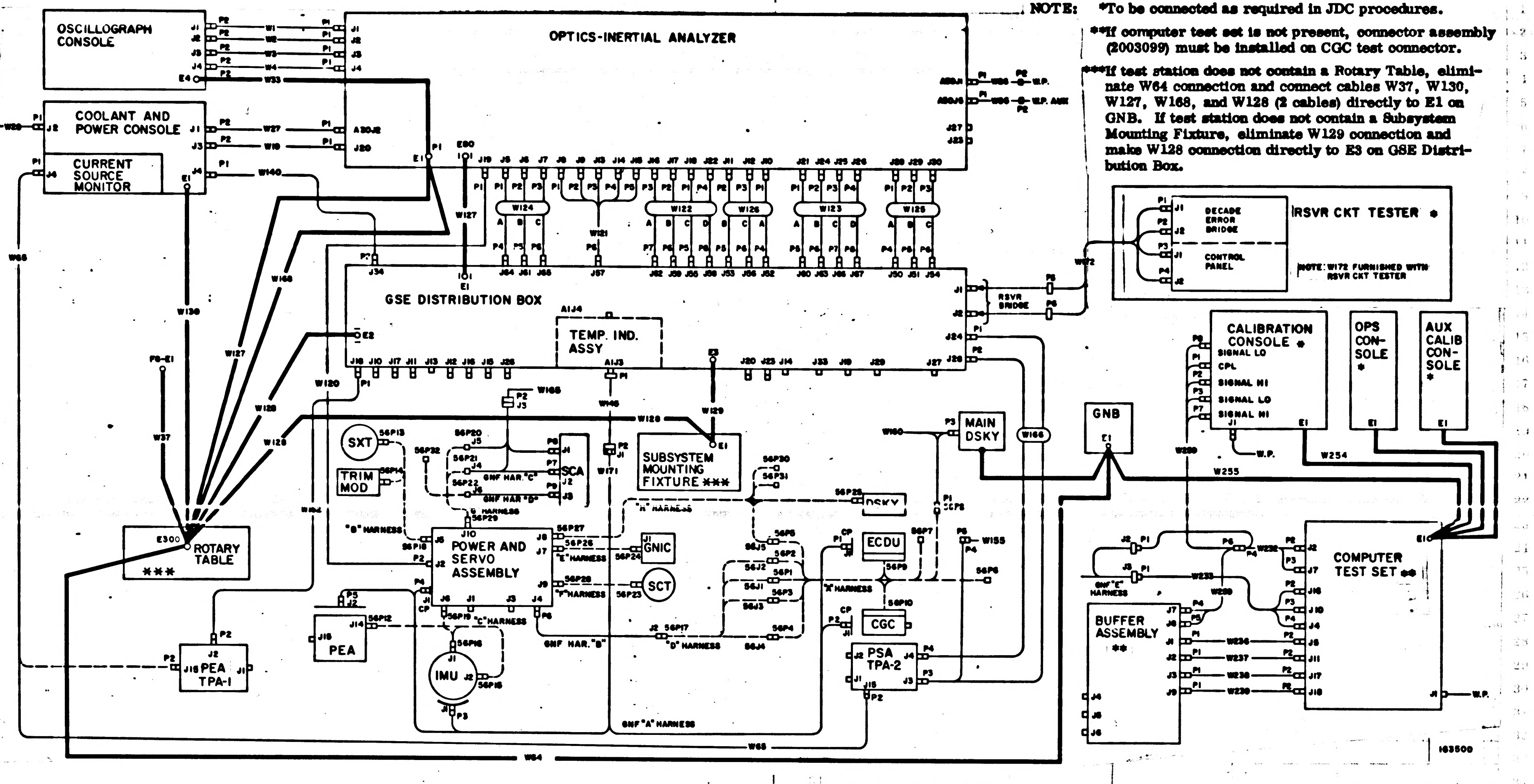
JOB G & N SYSTEM FOR TESTING | JDC 12201 REV L PAGE 10 OF 16
SUBSYSTEM G & N SYSTEM | ASSY


OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
OPS CONSOLE *
AUX CALIB CONSOLE *
GNB
MAIN DSKY
DSKY
SUBSYSTEM MOUNTING FIXTURE ***
ROTARY TABLE ***
E300
SXT
TRIM MOD
SCA
POWER AND SERVO ASSEMBLY
GNIC
SCT
ECDU
CGC
PSA TPA-2
PEA TPA-1
PEA
IMU
COMPUTER TEST SET **
BUFFER ASSEMBLY **
W1
W2
W3
W4
W33
W27
W19
W28
W140
W66
W130
W127
W168
W120
W128
W129
W37
W148
W171
W121
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W126
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W172
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W166
W254
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W232
W233
W236
W237
W238
W239
W63
W64
W.P.
W.P. AUX
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"F" HARNESS
"H" HARNESS
"X" HARNESS
GNF HAR. "B"
GNF HAR "C"
GNF "A" HARNESS
GNF "E" HARNESS
163500

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

***If test station does not contain a Rotary Table, eliminate W64 connection and connect cables W37, W130, W127, W168, and W128 (2 cables) directly to E1 on GNB. If test station does not contain a Subsystem Mounting Fixture, eliminate W129 connection and make W128 connection directly to E3 on GSE Distribution Box.

Figure 2

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32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

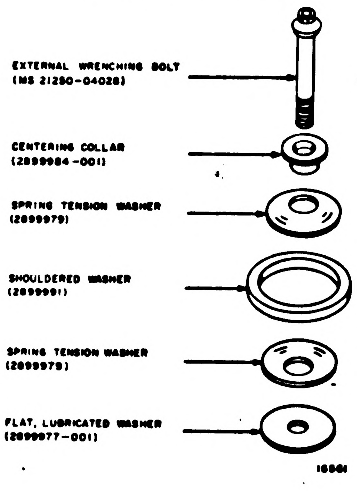
EXTERNAL WRENCHING BOLT (MS 21250-04028)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16961

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-322) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

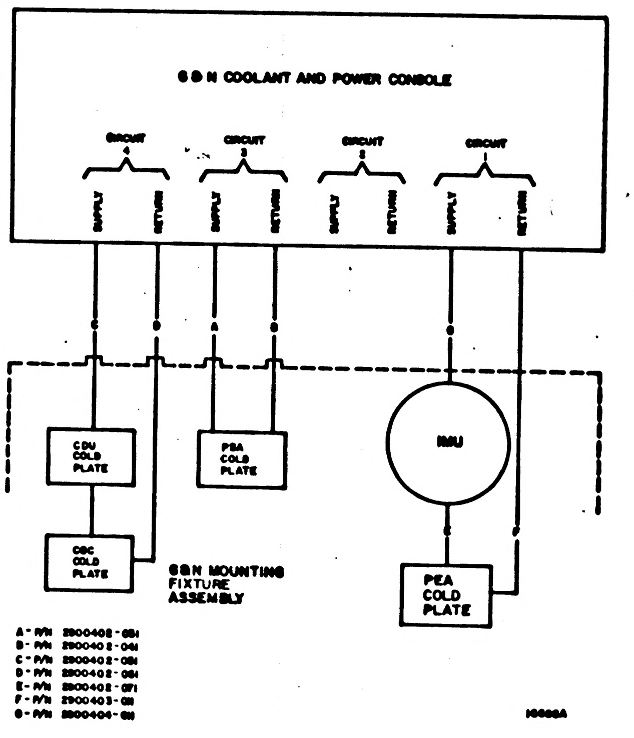

Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of lubricant (MIL M7866) on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt, (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

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82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

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INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM | ASSY

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12,15,16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-
F	4-27-67	33679	2	-	EA	-
G	6-6-67	33902	15	-	EA	-
H	7-20-67	34174	9,10,14,15	-	SB	-
J	8-24-67	34432	2.4.5.6. 8.9.10,16		EA	
K	10-12-67	34845	2, 3	-	EA	-
L	11-9-67	35032	3,7,9,10	-	EA	-
M	3-19-68	35887	2,3,7,10, 12,15	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Lubricant (MIL M7866) (Alphamolykote type Z NAA Spec MA 0112-02)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a horizontal position. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly.

4. Install three fixed memory rope modules and either one or three jumper modules in CGC as specified on Drawing 2021104 and as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

4A. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

B1 Fixed Memory Module	B2 Fixed Memory Module
B3 Fixed Memory Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

Figure 1.

5. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670).	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900[illegible]21) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W25 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458) (2 required)			
Subsystem Mounting Fixture	E1					
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J8	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J7	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J6	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W163 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections

• From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness	J3	P2	W165
	P21	.J4	(2900924)	P7	J2	SCA, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

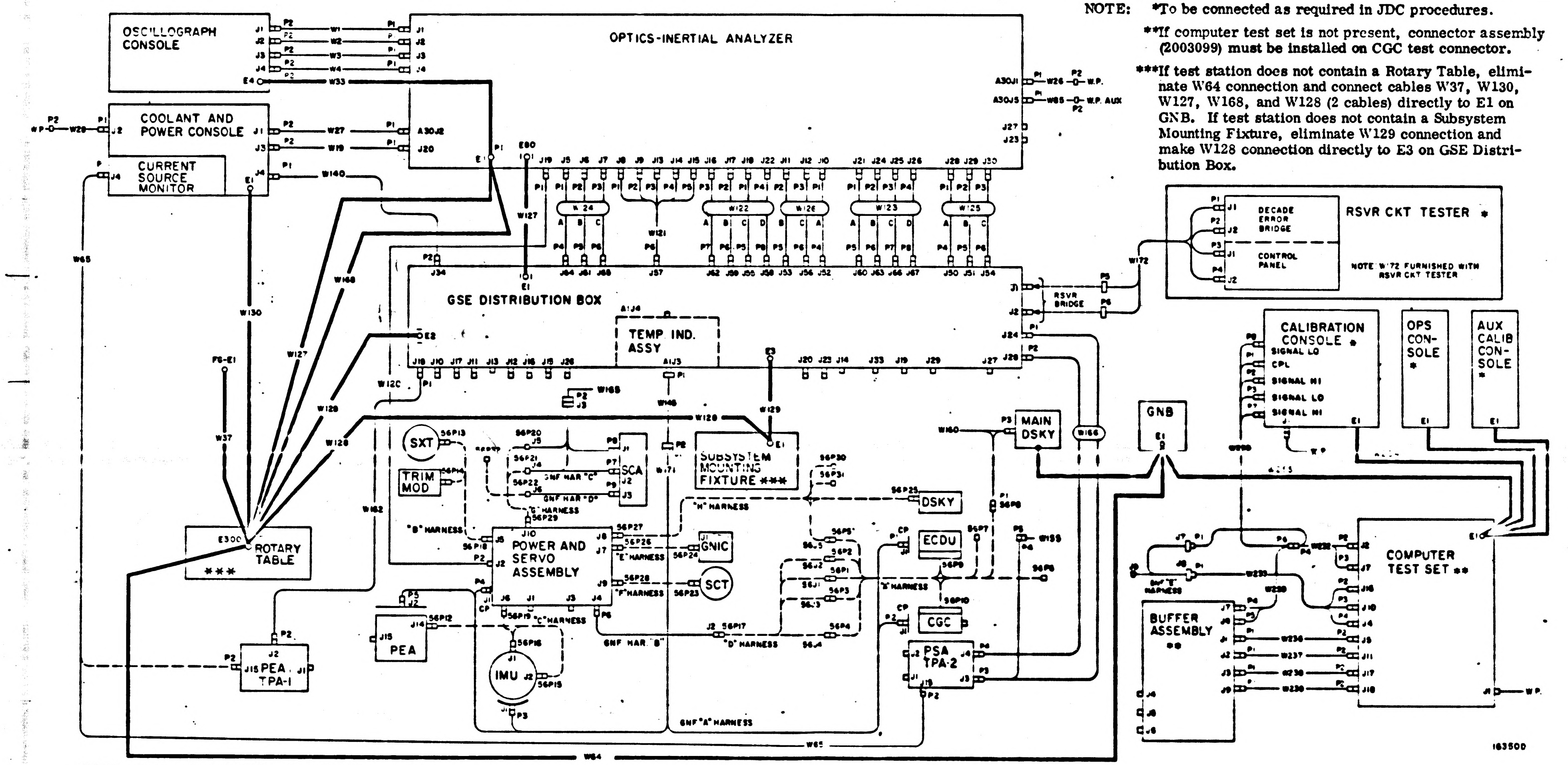
31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

ASSEMBLY AND PREPARATION OF
JOB G & N SYSTEM FOR TESTING | JDC 12201 REV M PAGE 10 OF 16
SUBSYSTEM G & N SYSTEM | ASSY

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

***If test station does not contain a Rotary Table, eliminate W64 connection and connect cables W37, W130, W127, W168, and W128 (2 cables) directly to E1 on GNB. If test station does not contain a Subsystem Mounting Fixture, eliminate W129 connection and make W128 connection directly to E3 on GSE Distribution Box.


OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
A30J1
A30J5
W26
W85
W.P.
W.P. AUX
W1
W2
W3
W4
W33
W27
W19
W140
W29
W24
W121
W122
W126
W123
W125
W127
W168
W130
W65
W37
W128
W129
W120
W162
W64
W160
W166
W172
GSE DISTRIBUTION BOX
TEMP IND. ASSY
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
OPS CON-SOLE *
AUX CALIB CON-SOLE *
GNB
MAIN DSKY
SXT
TRIM MOD
SCA
SUBSYSTEM MOUNTING FIXTURE ***
DSKY
GNIC
ECDU
SCT
CGC
PSA TPA-2
POWER AND SERVO ASSEMBLY
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"F" HARNESS
"H" HARNESS
GNF "A" HARNESS
GNF HAR "B"
GNF HAR "C"
GNF HAR "D"
ROTARY TABLE ***
E30C
PEA
PEA TPA-1
IMU
COMPUTER TEST SET **
BUFFER ASSEMBLY **
W232
W233
W236
W237
W238
W239
163500

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G & N Mounting Fixture.

Figure 2

DATE 30 JUN 66

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

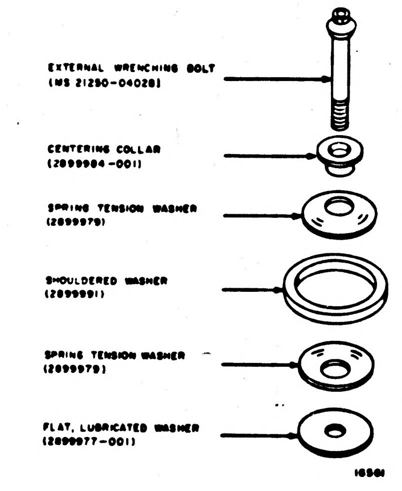

EXTERNAL WRENCHING BOLT (MS 21250-04028)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16561

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

---

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

CAUTION: Use extreme care when installing connector to J9 on the DSKY to prevent pin damage. Adapter cables may be used on the DSKY connector J9 to facilitate harness connections and to prevent pin damage.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

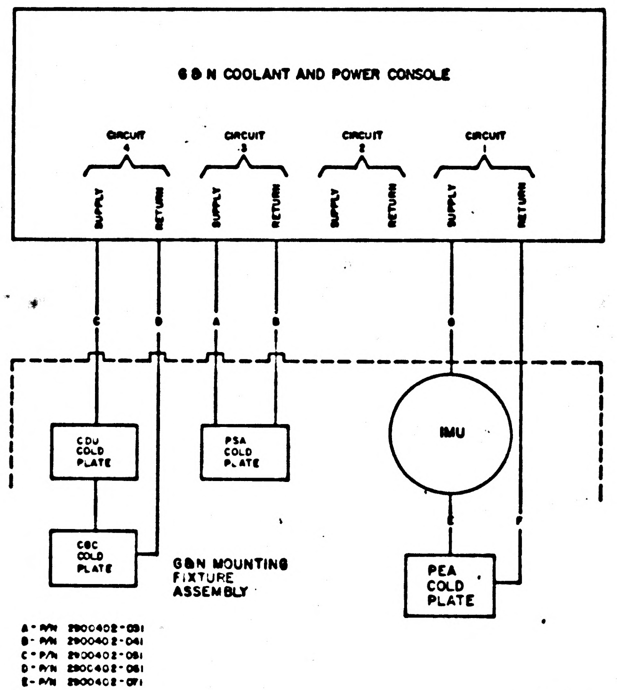


Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of lubricant (MIL M7866) on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following three steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY ON NAV BASE

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

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82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-
F	4-27-67	33679	2	-	EA	-
G	6-6-67	33902	15	-	EA	-
H	7-20-67	34174	9,10,14,15	-	SB	-
J	8-24-67	34432	2, 4, 5, 6, 8,9,10,16		EA	
K	10-12-67	34848	2, 3	-	EA	-
L	11-9-67	35032	3,7,9,10	-	EA	-
M	3-19-68	35887	2,3,7,10, 12,15	-	EA	-
N	3-22-68	35929	4	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

FORM 0-143
Chg. 7-23-66

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Lubricant (MIL M7866) (Alphamolykote type Z NAA Spec MA 0112-02)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly.

4. Install three fixed memory rope modules and either one or three jumper modules in CGC as specified on Drawing 2021104 and as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

4A. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

B1 Fixed Memory Module	B2 Fixed Memory Module
B3 Fixed Memory Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

Figure 1.

5. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35306-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position

when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.)

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may cause connector damage.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

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22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458) (2 required)			
Subsystem Mounting Fixture	E1					
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J8	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J7	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

• From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCA, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

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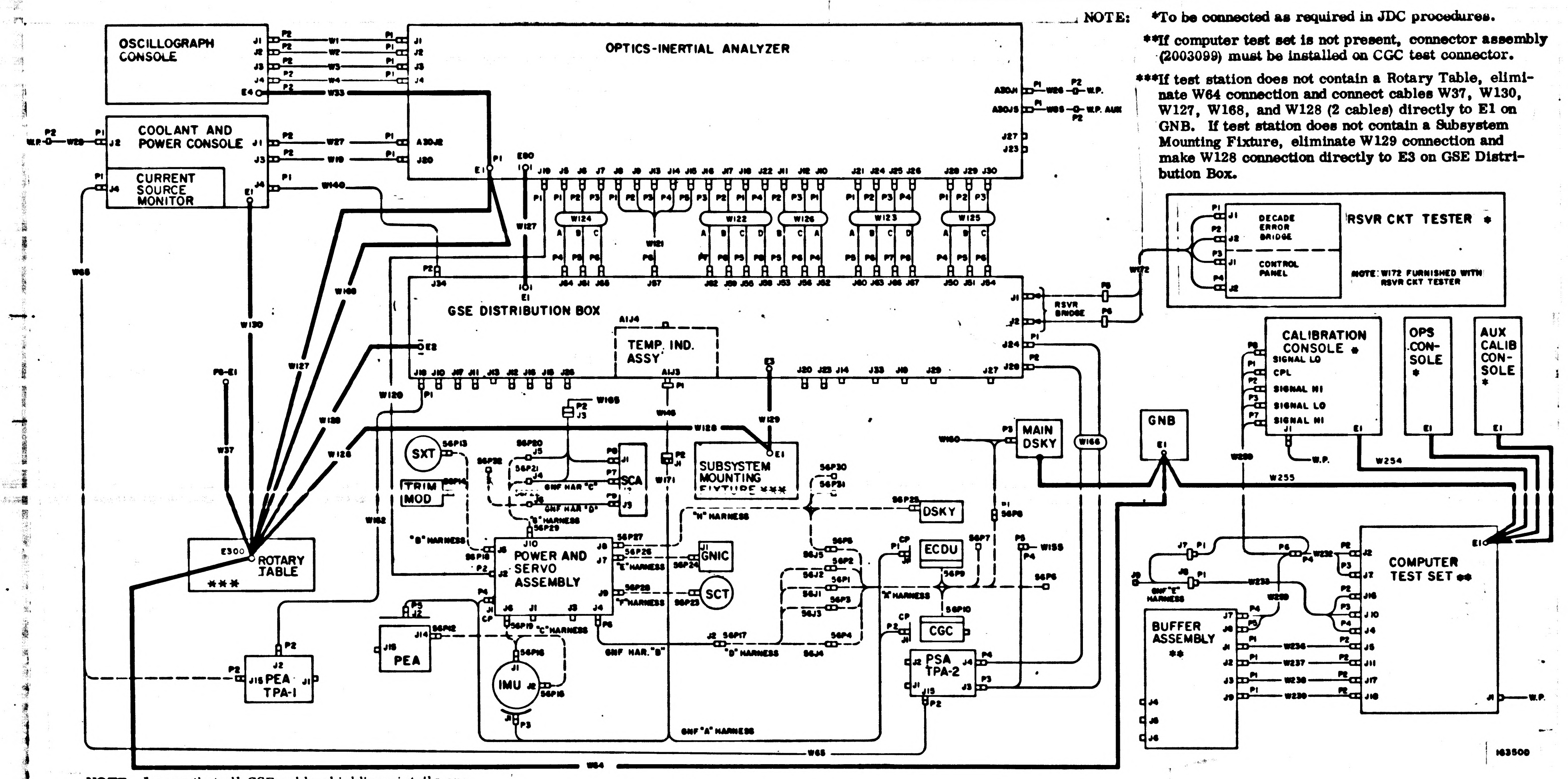
SUBSYSTEM G & N SYSTEM | ASSY

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

***If test station does not contain a Rotary Table, eliminate W64 connection and connect cables W37, W130, W127, W168, and W128 (2 cables) directly to E1 on GNB. If test station does not contain a Subsystem Mounting Fixture, eliminate W129 connection and make W128 connection directly to E3 on GSE Distribution Box.


OSCILLOGRAPH CONSOLE
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
OPTICS-INERTIAL ANALYZER
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
OPS CON-SOLE *
AUX CALIB CON-SOLE *
GNB
MAIN DSKY
SUBSYSTEM MOUNTING FIXTURE ***
ROTARY TABLE ***
E300
SXT
TRIM MOD
SCA
POWER AND SERVO ASSEMBLY
GNIC
SCT
DSKY
ECDU
CGC
PEA
IMU
PEA TPA-1
PSA TPA-2
COMPUTER TEST SET **
BUFFER ASSEMBLY **
W64
W65
W.P.
W.P. AUX
163500

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G & N Mounting Fixture.

Figure 2

DATE 30 JUN 66

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

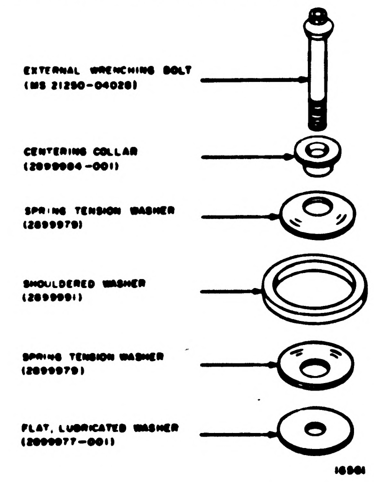

EXTERNAL WRENCHING BOLT (MS 21250-04026)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899981)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16861

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

CAUTION: Use extreme care when installing connector to J9 on the DSKY to prevent pin damage. Adapter cables may be used on the DSKY connector J9 to facilitate harness connections and to prevent pin damage.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

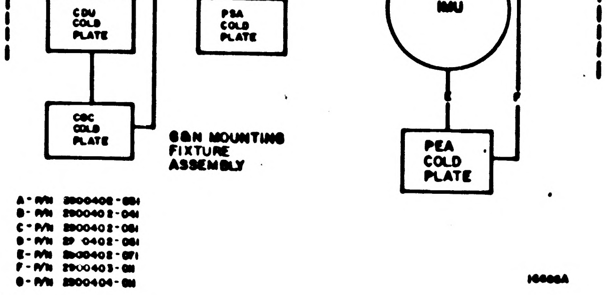

Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-063). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of lubricant (MIL M7866) on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following three steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY ON NAV BASE

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten, in numerical sequence, to 50-55 inch-pounds in approximately 10 inch-pound increments. Back off the bolts approximately 75 degrees.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

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82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-
F	4-27-67	33679	2	-	EA	-
G	6-6-67	33902	15	-	EA	-
H	7-20-67	34174	9,10,14,15	-	SB	-
J	8-24-67	34432	2, 4, 5, 6, 8,9,10,16		EA	
K	10-12-67	34848	2, 3	-	EA	-
L	11-9-67	35032	3,7,9,10	-	EA	-
M	3-19-68	35887	2,3,7,10, 12,15	-	EA	-
N	5-22-68	35329	4	-	EA	-
P	8-5-68	36625	12, 16	-	EA AD	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM FOR TESTING

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SUBSYSTEM G & N SYSTEM

ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Lubricant (MIL M7866) (Alphamolykote type Z NAA Spec MA 0112-02)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly.

4. Install three fixed memory rope modules and either one or three jumper modules in CGC as specified on Drawing 2021104 and as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

4A. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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SUBSYSTEM G & N SYSTEM

ASSY

B1 Fixed Memory Module	B2 Fixed Memory Module
B3 Fixed Memory Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

Figure 1.

5. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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SUBSYSTEM G & N SYSTEM

ASSY

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position

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when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.)

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may cause connector damage.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

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22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458) (2 required)			
Subsystem Mounting Fixture	E1					
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J8	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J7	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCA, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20 25 inch-pounds.

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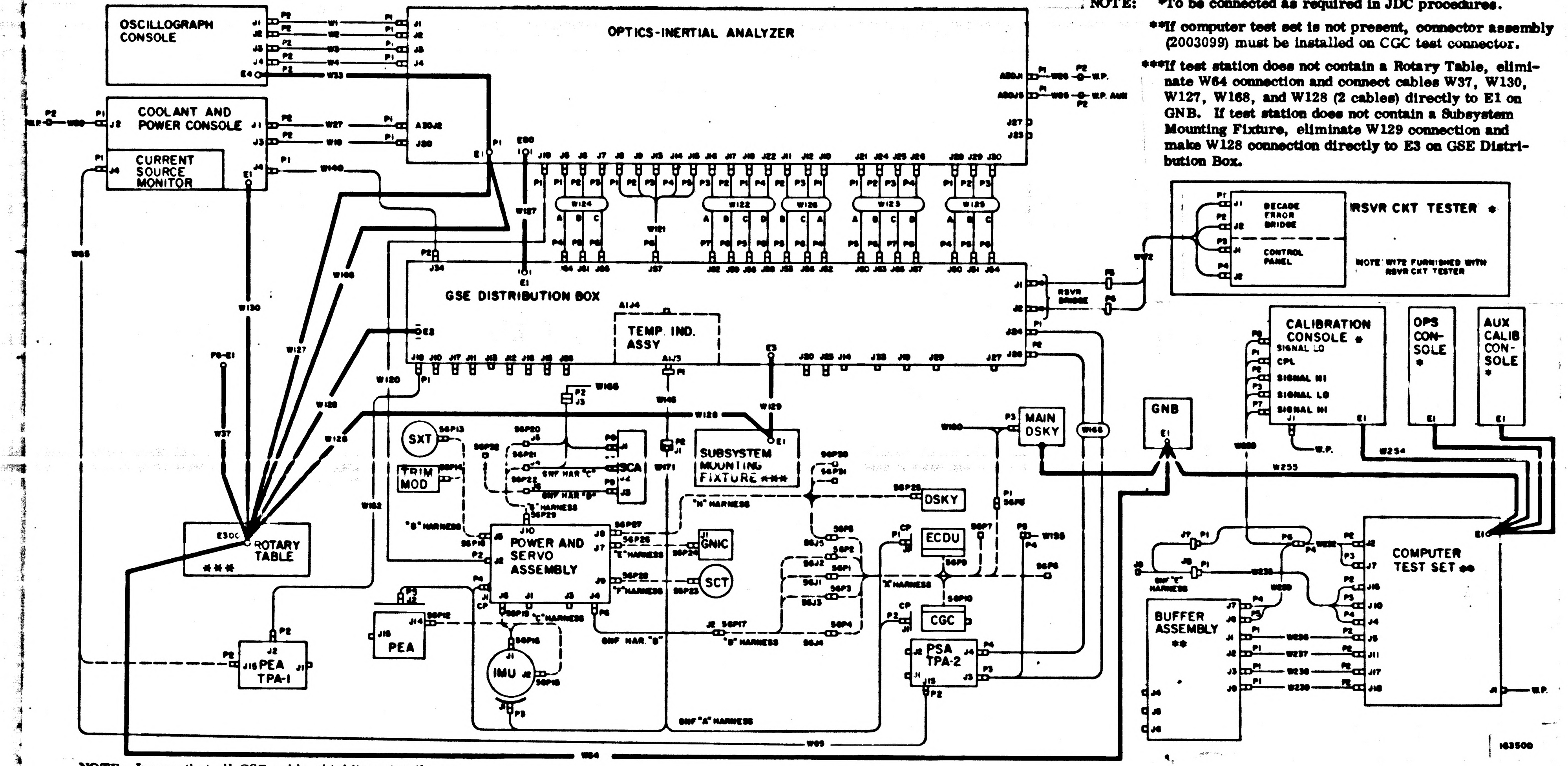
NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

***If test station does not contain a Rotary Table, eliminate W64 connection and connect cables W37, W130, W127, W168, and W128 (2 cables) directly to E1 on GNB. If test station does not contain a Subsystem Mounting Fixture, eliminate W129 connection and make W128 connection directly to E3 on GSE Distribution Box.


OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CONSOLE *
AUX CALIB CONSOLE *
GNB
MAIN DSKY
SUBSYSTEM MOUNTING FIXTURE ***
ROTARY TABLE ***
SXT
TRIM MOD
SCA
POWER AND SERVO ASSEMBLY
GNIC
SCT
DSKY
ECDU
CGC
PEA
PEA TPA-1
IMU
PSA TPA-2
BUFFER ASSEMBLY **
COMPUTER TEST SET **
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"F" HARNESS
"H" HARNESS
"X" HARNESS
GNF "A" HARNESS
GNF "E" HARNESS
W.P.
W.P. AUX
W1
W2
W3
W4
W33
W27
W19
W37
W64
W65
W120
W121
W122
W123
W126
W127
W128
W129
W130
W145
W152
W155
W160
W166
W168
W171
W172
W230
W232
W236
W237
W238
W239
W254
W255
163500

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G & N Mounting Fixture.

Figure 2

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32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

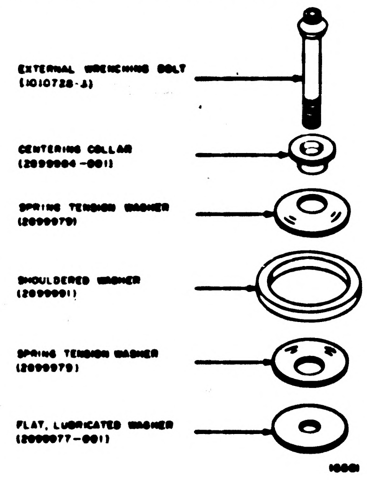
EXTERNAL WRENCHING BOLT (1010728-3)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899981)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
1000I

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

CAUTION: Use extreme care when installing connector to J9 on the DSKY to prevent pin damage. Adapter cables may be used on the DSKY connector J9 to facilitate harness connections and to prevent pin damage.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

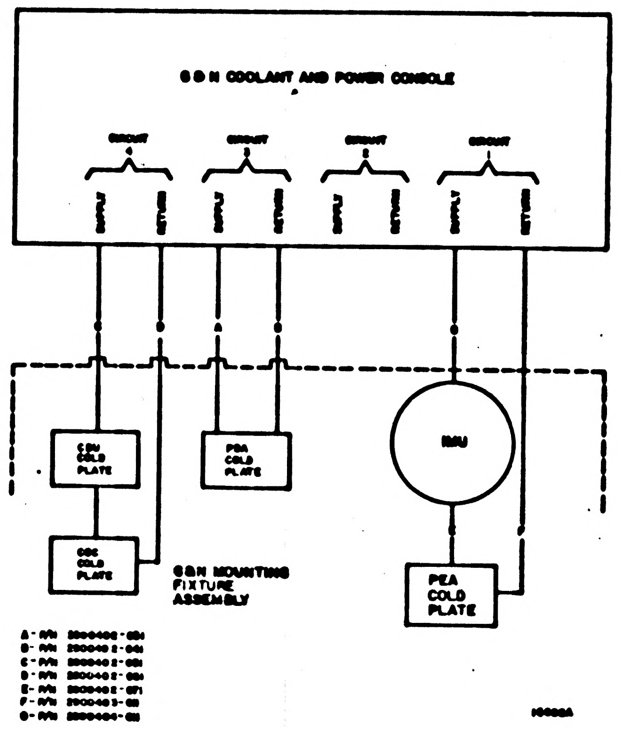

Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-063). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of lubricant (MIL M7866) on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following three steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY ON NAV BASE

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten three bolts to 50-55 inch-pounds in 10 inch-pound increments, starting with SXT side, then SCT side, and then center. Back off the bolts approximately 75 degrees.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

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82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING | JDC 12201 REV. R PAGE 1 OF 17
INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30300	2, 3, 8, 9, 11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-
F	4-27-67	33679	2	-	EA	-
G	6-6-67	33902	15	-	EA	-
H	7-20-67	34174	9,10,14,15	-	SB	-
J	8-24-67	34432	2, 4, 5, 6, 8,9,10,16		EA	
K	10-12-67	34848	2, 3	-	EA	-
L	11-9-67	35032	3,7,9,10	-	EA	-
M	3-19-68	35887	2, 3, 7, 10, 12, 15	-	EA	-
N	3-22-68	35929	4	-	EA	-
P	8-5-68	36625	12, 16	-	EA	-
R	9-26-68	36861	1	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components. Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Lubricant (MIL M7866) (Alphamolykote type Z NAA Spec MA 0112-02)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly.

4. Install three fixed memory rope modules and either one or three jumper modules in CGC as specified on Drawing 2021104 and as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

4A. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

B1 Fixed Memory Module	B2 Fixed Memory Module
B3 Fixed Memory Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

Figure 1.

5. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P5 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position

when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.)

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may cause connector damage.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458) (2 required)			
Subsystem Mounting Fixture	E1					
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J8	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J7	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCA, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

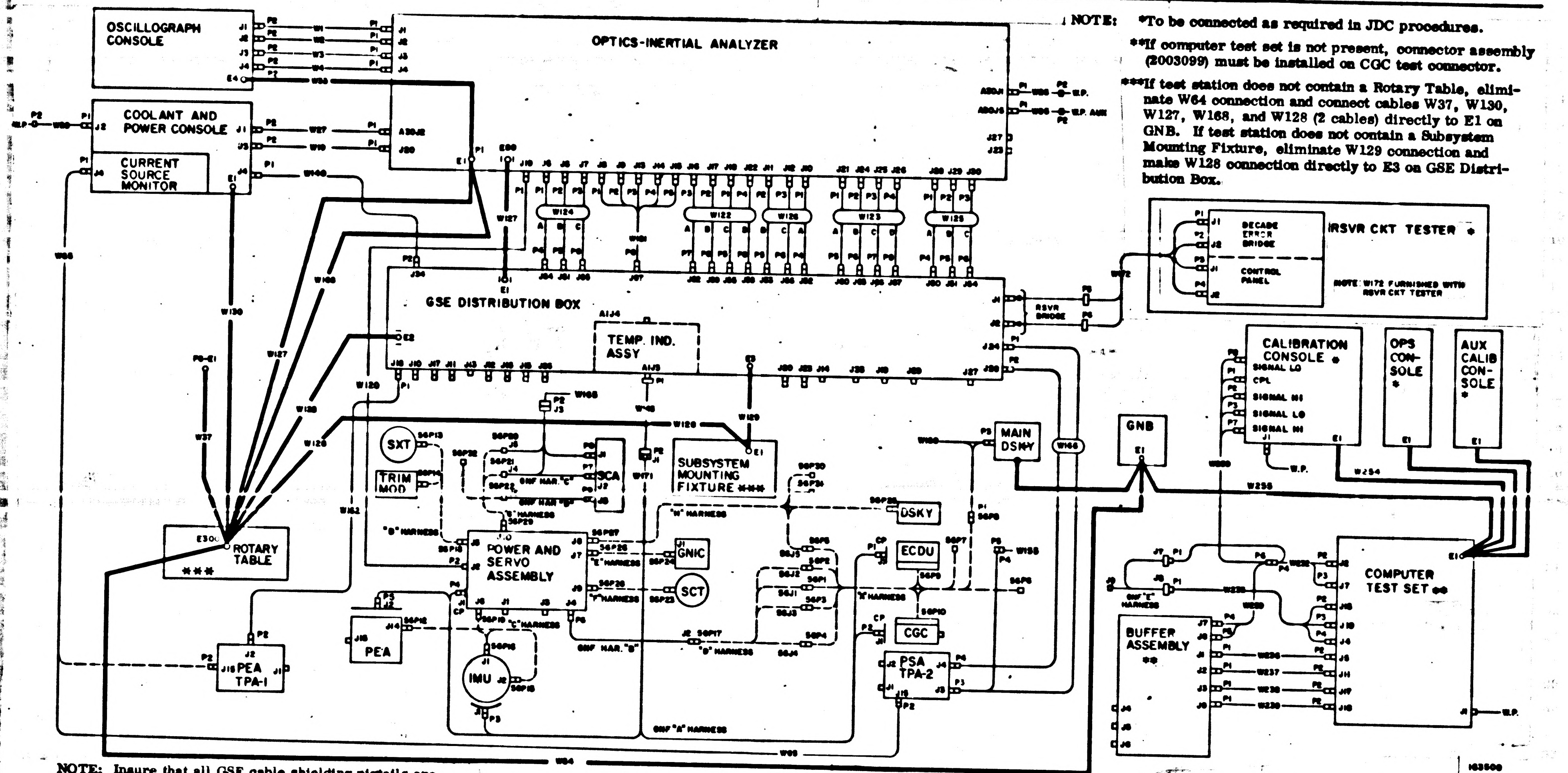
31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

ASSEMBLY AND PREPARATION OF JOB G & N SYSTEM FOR TESTING	JDC 12201 REV R PAGE 11 OF 17
SUBSYSTEM G & N SYSTEM	ASSY

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

***If test station does not contain a Rotary Table, eliminate W64 connection and connect cables W37, W130, W127, W168, and W128 (2 cables) directly to E1 on GNB. If test station does not contain a Subsystem Mounting Fixture, eliminate W129 connection and make W128 connection directly to E3 on GSE Distribution Box.



OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
IRSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
RSVR BRIDGE
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
OPS CONSOLE *
AUX CALIB CONSOLE *
GNB
MAIN DSKY
SUBSYSTEM MOUNTING FIXTURE ***
SXT
TRIM MOD
SCA
POWER AND SERVO ASSEMBLY
GNIC
SCT
DSKY
ECDU
CGC
PSA TPA-2
PEA TPA-1
PEA
IMU
ROTARY TABLE ***
COMPUTER TEST SET **
BUFFER ASSEMBLY **
W124
W122
W126
W123
W125
W127
W130
W37
W128
W129
W168
W152
W64
W66
W44
W166
W172
W254
W255
W236
W237
W238
W239
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"H" HARNESS
GNF "A" HARNESS
W.P.
W.P. AUX

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G & N Mounting Fixture.

Figure 2

DATE 30 JUN 66

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

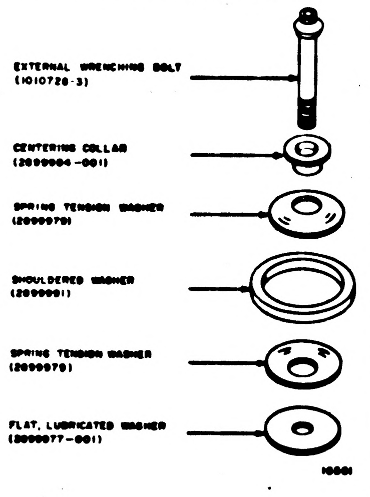

EXTERNAL WRENCHING BOLT (1010728-3)
CENTERING COLLAR (2899904-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899981)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16661

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

CAUTION: Use extreme care when installing connector to J9 on the DSKY to prevent pin damage. Adapter cables may be used on the DSKY connector J9 to facilitate harness connections and to prevent pin damage.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

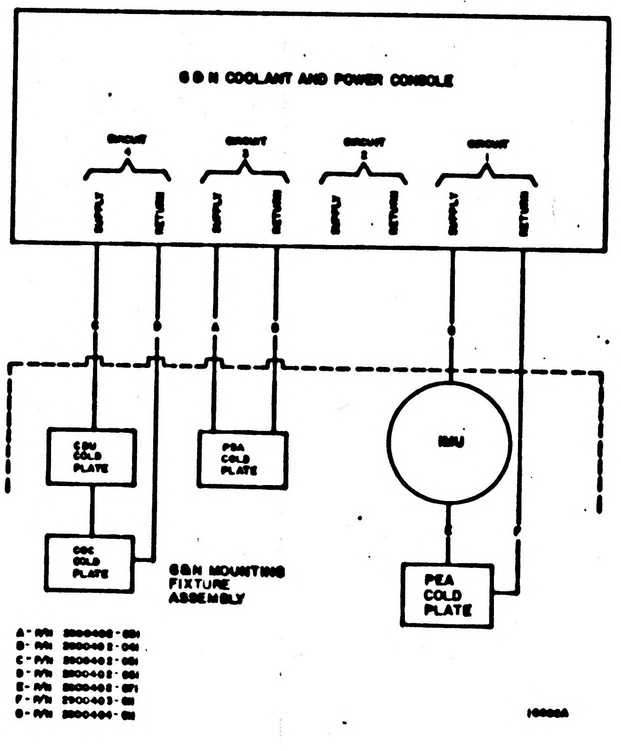

Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-063). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds). A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of lubricant (MIL M7866) on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following three steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY ON NAV BASE

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten three bolts to 50-55 inch-pounds in 10 inch-pound increments, starting with SXT side, then SCT side, and then center. Back off the bolts approximately 75 degrees.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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INITIAL TDRR 29882 **D.S. PGS** –

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-
F	4-27-67	33679	2	-	EA	-
G	6-6-67	33902	15	-	EA	-
H	7-20-67	34174	9,10,14,15	-	SB	-
J	8-24-67	34432	2,4,5,6, 8,9,10,16		EA	
K	10-12-67	34848	2, 3	-	EA	-
L	11-9-67	35032	3,7,9,10	-	EA	-
M	3-19-68	35887	2,3,7,10, 12,15	-	EA	-
N	3-22-68	35929	4	-	EA	-
P	8-5-68	36625	12, 16	-	EA	-
R	9-26-68	36861	1	-	EA	-
S	10-21-68	36934	2, 3, 15	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Powder, Molybdenum Disulfide SCD 1008955 (Molykote powder)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly.

4. Install three fixed memory rope modules and either one or three jumper modules in CGC as specified on Drawing 2021104 and as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

4A. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

B1 Fixed Memory Module	B2 Fixed Memory Module
B3 Fixed Memory Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

Figure 1.

5. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P8 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Deleted.

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position

when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.)

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may cause connector damage.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35306-322).

22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458) (2 required)			
Subsystem Mounting Fixture	E1					
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J8	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J7	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCA, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

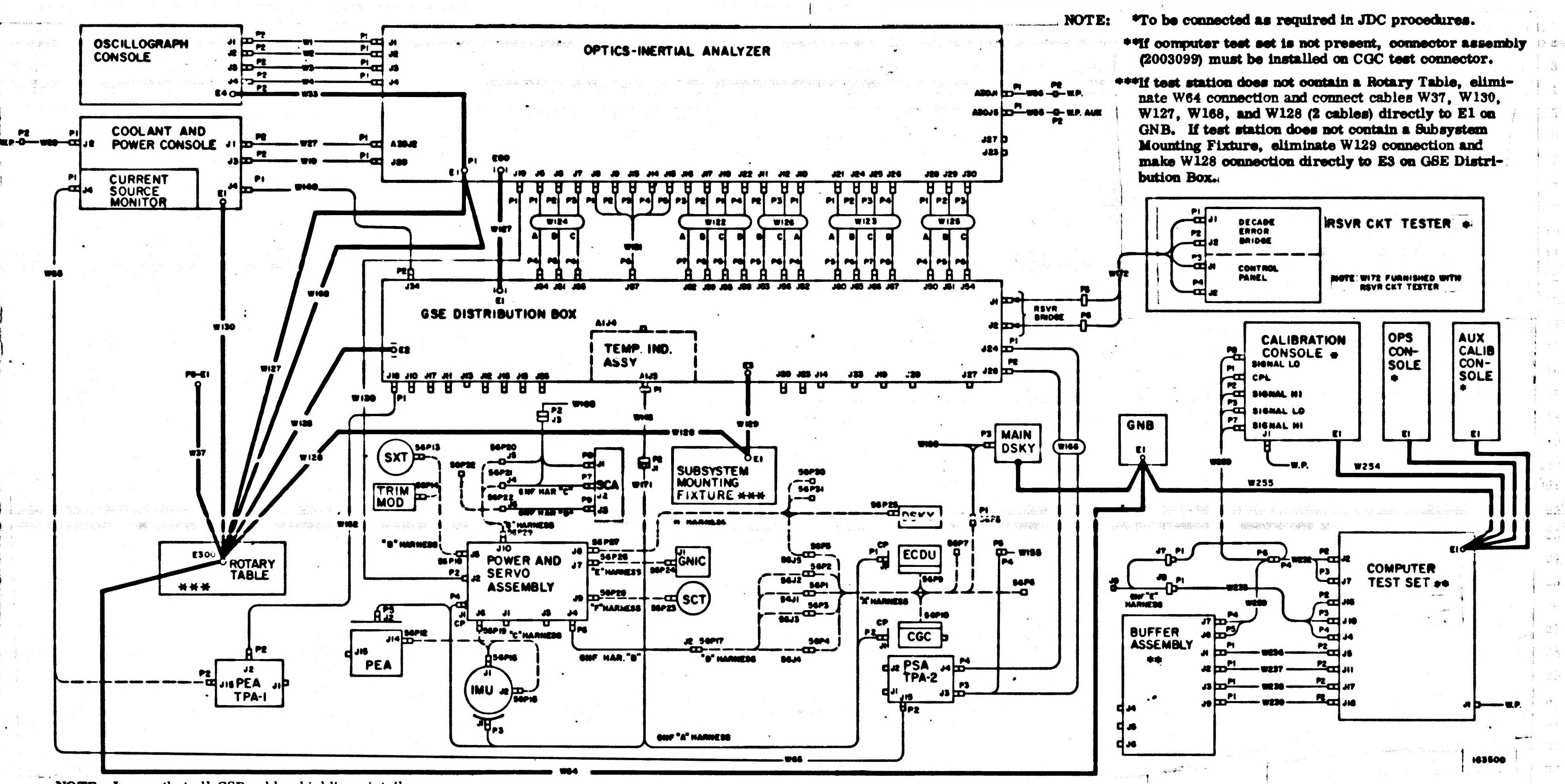
PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

***If test station does not contain a Rotary Table, eliminate W64 connection and connect cables W37, W130, W127, W168, and W128 (2 cables) directly to E1 on GNB. If test station does not contain a Subsystem Mounting Fixture, eliminate W129 connection and make W128 connection directly to E3 on GSE Distribution Box.


OSCILLOGRAPH CONSOLE
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
OPTICS-INERTIAL ANALYZER
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
SUBSYSTEM MOUNTING FIXTURE ***
ROTARY TABLE ***
SXT
TRIM MOD
SCA
POWER AND SERVO ASSEMBLY
GNIC
SCT
IMU
PEA
PEA TPA-1
PSA TPA-2
ECDU
CGC
DSKY
MAIN DSKY
GNB
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
OPS CONSOLE *
AUX CALIB CONSOLE *
COMPUTER TEST SET **
BUFFER ASSEMBLY **
W.P.
W.P. AUX
W64
W65
W37
W130
W127
W168
W128
W129
W254
W255
W166
W124
W122
W126
W123
W125
W172
E1
E2
E3
"A" HARNESS
"B" HARNESS
"C" HARNESS
"E" HARNESS
"Y" HARNESS
GNF HAR. "C"
GNF HAR. "B"
GNF "A" HARNESS
163500

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G & N Mounting Fixture.

Figure 2

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32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

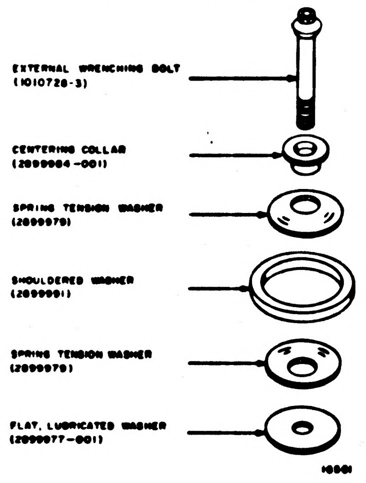
EXTERNAL WRENCHING BOLT (1010728-3)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16861

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

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44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

CAUTION: Use extreme care when installing connector to J9 on the DSKY to prevent pin damage. Adapter cables may be used on the DSKY connector J9 to facilitate harness connections and to prevent pin damage.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

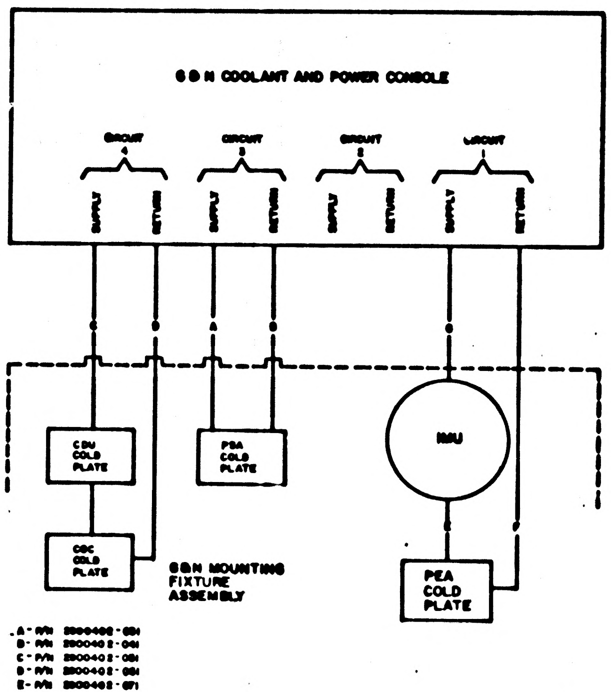

Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-063). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds. A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds).

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place thin coating of Molykote powder on the mounting bolt threads. Wipe off all but a thin coating with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following three steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY ON NAV BASE

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten three bolts to 50-55 inch-pounds in 10 inch-pound increments, starting with SXT side, then SCT side, and then center. Back off the bolts approximately 75 degrees.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

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82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30300	2, 3, 8, 9, 11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2, 5, 8-10, 12	-	EA	-
F	4-27-67	33679	2	-	EA	-
G	6-6-67	33902	15	-	EA	-
H	7-20-67	34174	9, 10, 14, 15	-	SB	-
J	8-24-67	34432	2, 4, 5, 6, 8, 9, 10, 16		EA	
K	10-12-67	34848	2, 3	-	EA	-
L	11-9-67	35032	3, 7, 9, 10	-	EA	-
M	3-19-68	35887	2, 3, 7, 10, 12, 15	-	EA	-
N	3-22-68	35929	4	-	EA	-
P	8-5-68	36625	12, 16	-	EA	-
R	9-26-68	36861	1	-	EA	-
S	10-21-68	36934	2, 3, 15	-	EA	-
T	1-30-69	37271	1	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: 1. The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

2. Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

3. Refer to JDC 17104 for removal and replacement procedures when complete G & N System disassembly or component removal is to be accomplished.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM FOR TESTING

JDC 12201 REV T PAGE 2 OF 17

SUBSYSTEM G & N SYSTEM

ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Powder, Molybdenum Disulfide SCD 1008955 (Molykote powder)

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly.

4. Install three fixed memory rope modules and either one or three jumper modules in CGC as specified on Drawing 2021104 and as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

4A. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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SUBSYSTEM G & N SYSTEM

ASSY

B1 Fixed Memory Module	B2 Fixed Memory Module
B3 Fixed Memory Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

Figure 1.

5. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P8 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Deleted.

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV T PAGE 4 OF 17

SUBSYSTEM G & N SYSTEM

ASSY

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C448).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position

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when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.)

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may cause connector damage.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

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22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458) (2 required)			
Subsystem Mounting Fixture	E1					
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J8	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J7	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCA, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly [illegible]re on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

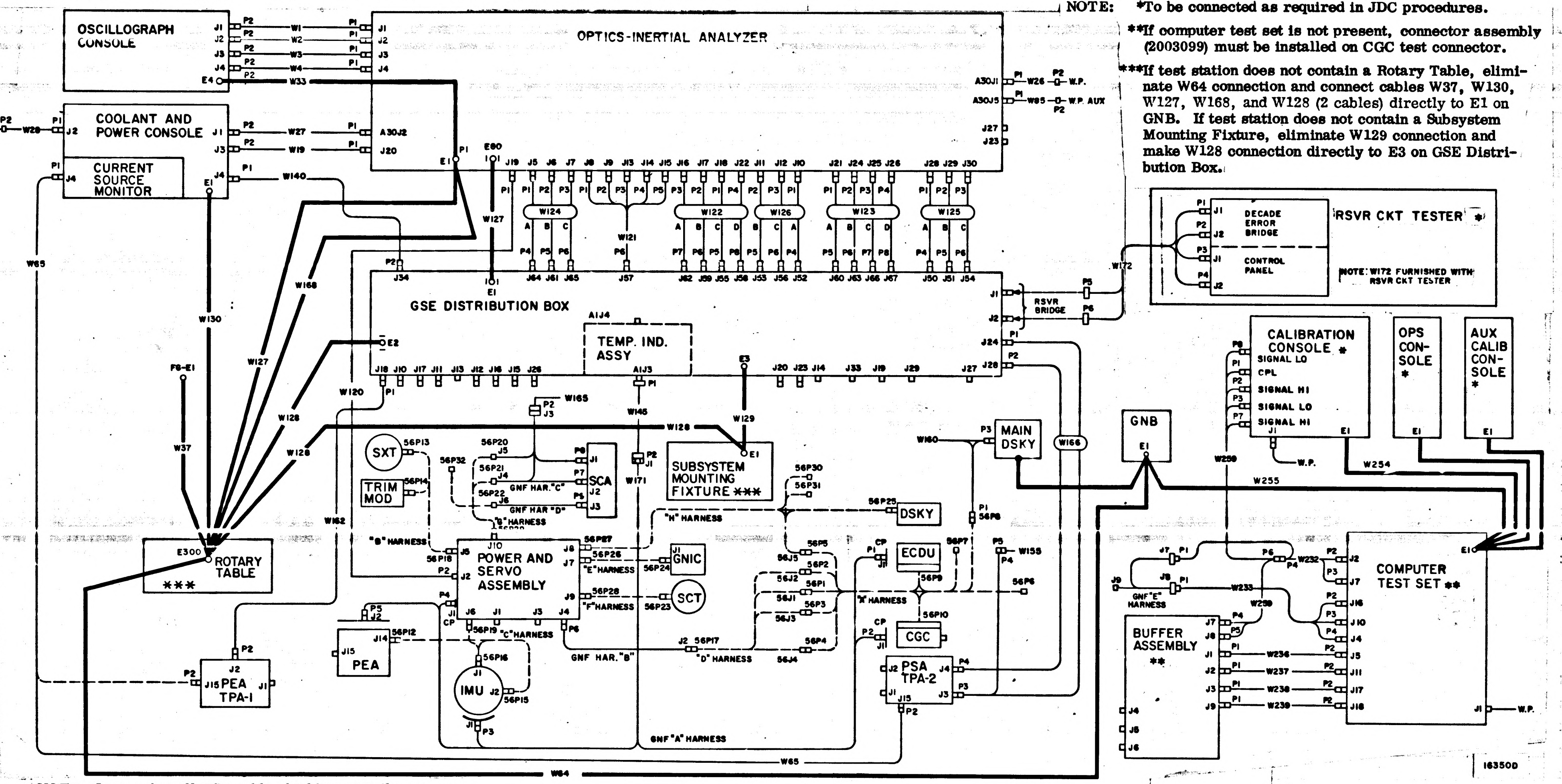
PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

***If test station does not contain a Rotary Table, eliminate W64 connection and connect cables W37, W130, W127, W168, and W128 (2 cables) directly to E1 on GNB. If test station does not contain a Subsystem Mounting Fixture, eliminate W129 connection and make W128 connection directly to E3 on GSE Distribution Box.



OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
W1
W2
W3
W4
W33
W27
W19
W140
W26
W85
W.P.
W.P. AUX
W29
W124
W121
W122
W126
W123
W125
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
W172
RSVR BRIDGE
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
OPS CON-SOLE *
AUX CALIB CON-SOLE *
W65
W130
W127
W168
W128
W37
W120
W162
W165
W146
W129
W171
W160
W166
W254
W255
W256
FS-E1
E300
ROTARY TABLE ***
SXT
TRIM MOD
SCA
SUBSYSTEM MOUNTING FIXTURE ***
MAIN DSKY
GNB
DSKY
GNIC
POWER AND SERVO ASSEMBLY
SCT
ECDU
CGC
PSA TPA-2
PEA
PEA TPA-1
IMU
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"F" HARNESS
"H" HARNESS
GNF HAR. "C"
GNF HAR. "D"
GNF HAR. "B"
GNF "A" HARNESS
GNF "E" HARNESS
W158
COMPUTER TEST SET **
BUFFER ASSEMBLY **
W232
W233
W234
W235
W236
W237
W238
W239
W64
163500

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G & N Mounting Fixture.

Figure 2

DATE 30 JUN 66

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

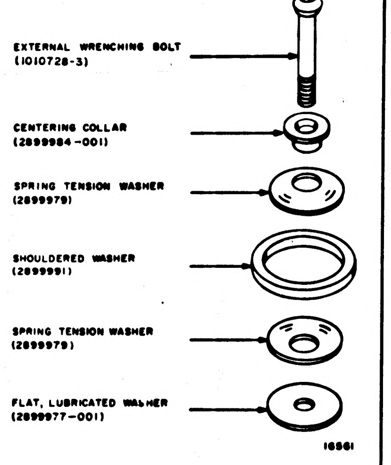

EXTERNAL WRENCHING BOLT (1010728-3)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16561

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

CAUTION: Use extreme care when installing connector to J9 on the DSKY to prevent pin damage. Adapter cables may be used on the DSKY connector J9 to facilitate harness connections and to prevent pin damage.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

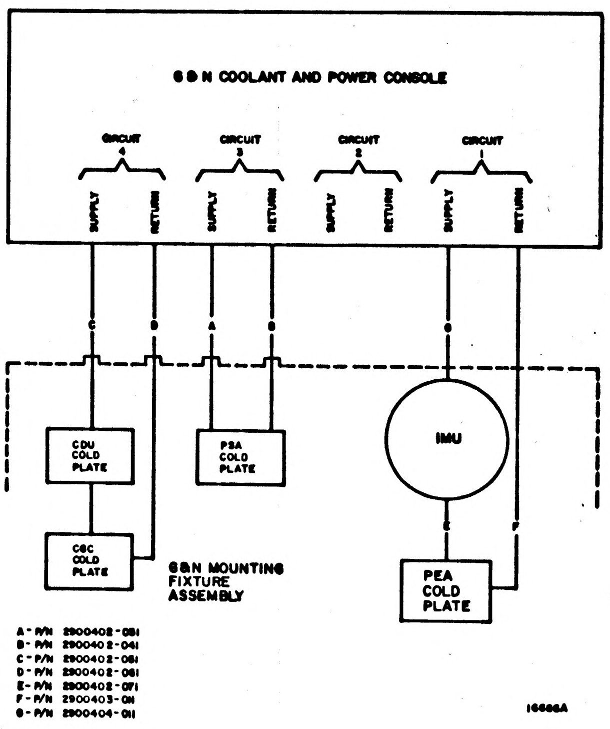


Figure 4.

54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds. A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds).

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place thin coating of Molykote powder on the mounting bolt threads. Wipe off all but a thin coating with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following three steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY ON NAV BASE

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten three bolts to 50-55 inch-pounds in 10 inch-pound increments, starting with SXT side, then SCT side, and then center. Back off the bolts approximately 75 degrees.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

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82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV. U PAGE 1 OF 17

INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-
F	4-27-67	33679	2	-	EA	-
G	6-6-67	33902	15	-	EA	-
H	7-20-67	34174	9,10,14,15	-	SB	-
J	8-24-67	34432	2,4,5,6, 8,9,10,16		EA	
K	10-12-67	34848	2, 3	-	EA	-
L	11-9-67	35032	3,7,9,10	-	EA	-
M	3-19-68	35887	2,3,7,10, 12,15	-	EA	-
N	3-22-68	35929	4	-	EA	-
P	8-5-68	36625	2, 16	-	EA AD	-
R	9-26-68	36861	1	-	EA	-
S	10-21-68	36934	2, 3, 15	-	EA	-
T	1-30-69	37271	1	-	EA JF	-
U	8-4-69	37718	2, 12, 16	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: 1. The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

2. Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

3. Refer to JDC 17104 for removal and replacement procedures when complete G & N System disassembly or component removal is to be accomplished.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FCR 1011BA
Chg. 3-8-66

JOB G & N SYSTEM FOR TESTING

JDC 12201 REV U PAGE 2 OF 17

SUBSYSTEM G & N SYSTEM

ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Powder, Molybdenum Disulfide SCD 1008955 (Molykote powder)
1	Polyurethane foam cleanroom wiper

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly.

4. Install three fixed memory rope modules and either one or three jumper modules in CGC as specified on Drawing 2021104 and as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

4A. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

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SUBSYSTEM G & N SYSTEM

ASSY

B1 Fixed Memory Module	B2 Fixed Memory Module
B3 Fixed Memory Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

Figure 1.

5. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P8 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Deleted.

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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SUBSYSTEM G & N SYSTEM

ASSY

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position

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when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.)

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may cause connector damage.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

---

22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458) (2 required)			
Subsystem Mounting Fixture	E1					
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J8	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J7	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To.
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCA, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

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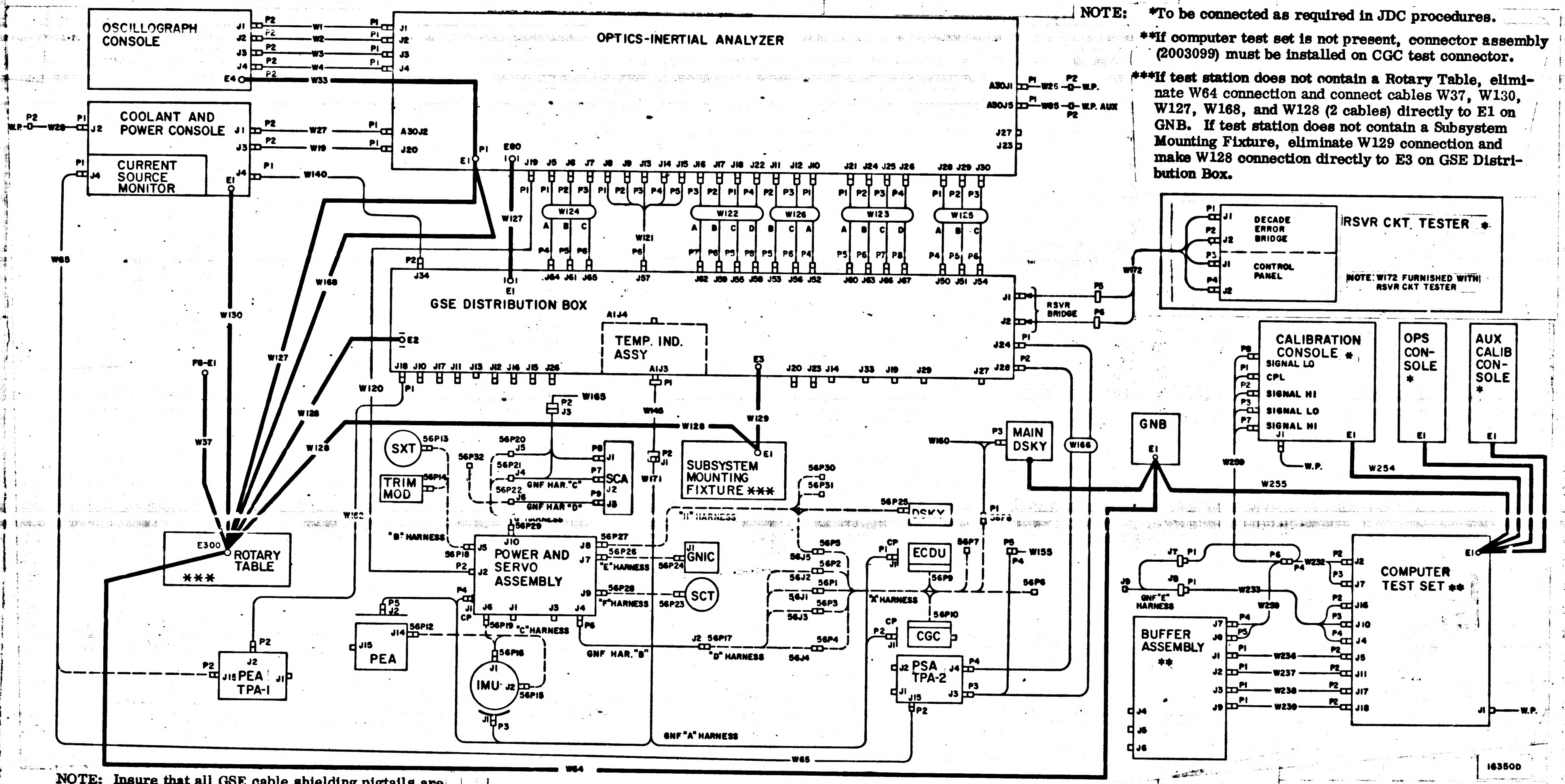
SUBSYSTEM G & N SYSTEM | ASSY

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

***If test station does not contain a Rotary Table, eliminate W64 connection and connect cables W37, W130, W127, W168, and W128 (2 cables) directly to E1 on GNB. If test station does not contain a Subsystem Mounting Fixture, eliminate W129 connection and make W128 connection directly to E3 on GSE Distribution Box.


OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
RSVR BRIDGE
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CON-SOLE *
AUX CALIB CON-SOLE *
GNB
MAIN DSKY
DSKY
SUBSYSTEM MOUNTING FIXTURE ***
ROTARY TABLE ***
E300
SXT
TRIM MOD
SCA
POWER AND SERVO ASSEMBLY
GNIC
SCT
IMU
PEA
PEA TPA-1
PSA TPA-2
ECDU
CGC
BUFFER ASSEMBLY **
COMPUTER TEST SET **
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"F" HARNESS
"H" HARNESS
"A" HARNESS
GNF HAR. "B"
GNF HAR. "C"
GNF HAR. "D"
GNF "A" HARNESS
GNF "E" HARNESS
W1
W2
W3
W4
W33
W26
W65
W27
W19
W28
W140
W127
W121
W124
W122
W126
W123
W125
W168
W130
W37
W120
W128
W128
W162
W165
W146
W129
W171
W172
W160
W166
W155
W254
W255
W259
W232
W233
W236
W237
W238
W239
W64
W65
W.P.
W.P. AUX
163500

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G & N Mounting Fixture.

Figure 2

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32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

> CAUTION: Use polyurethane foam cleanroom wiper to prevent coolant spillage on airborne equipment by wrapping wiper around quick-disconnect during mating and demating operations.

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

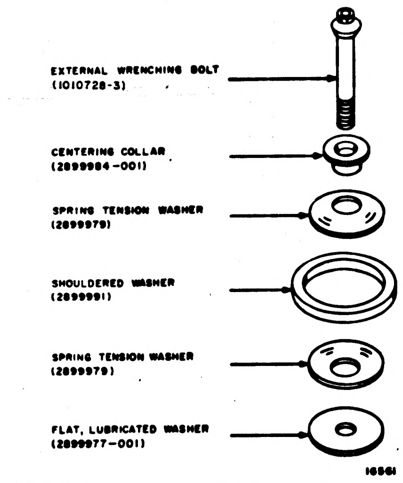
EXTERNAL WRENCHING BOLT (1010728-3)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899991)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16861

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA Coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

---

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the Inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

> NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

> CAUTION: Use extreme care when installing connector to J9 on the DSKY to prevent pin damage. Adapter cables may be used on the DSKY connector J9 to facilitate harness connections and to prevent pin damage.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

> NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

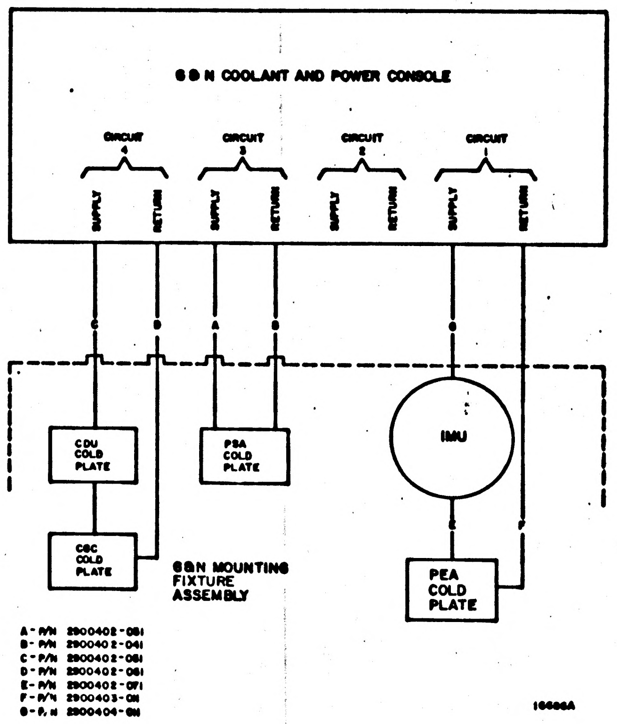

Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds. A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds).

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

> NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place thin coating of Molykote powder on the mounting bolt threads. Wipe off all but a thin coating with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

CAUTION: Use polyurethane foam cleanroom wiper to prevent coolant spillage on airborne equipment by wrapping wiper around quick-disconnect during mating and demating operations.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following three steps must be accomplished within 15 minutes of each other.

75. Set the FTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY ON NAV BASE

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs. Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten three bolts to 50-55 inch-pounds in 10 inch-pound increments, starting with SXT side, then SCT side, and then center. Back off the bolts approximately 75 degrees.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

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INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30300	2,3,8,9,11	-	EA	WS
B	9-15-66	31049	2-12, 15, 16	-	EA	-
C	11-10-66	31883	12, 16	-	EA	-
D	12-28-66	32472	2	-	JP	-
E	1-19-67	32682	2,5,8-10,12	-	EA	-
F	4-27-67	33679	2	-	EA	-
G	6-6-67	33902	15	-	EA	-
H	7-20-67	34174	9,10,14,15	-	SB	-
J	8-24-67	34432	2, 4, 5, 6, 8,9,10,16		EA	
K	10-12-67	34848	2, 3	-	EA	-
L	11-9-67	35032	3,7,9,10	-	EA	-
M	3-19-68	35887	2,3,7,10, 12,15	-	EA	-
N	3-22-68	35929	4	-	EA	-
P	8-5-68	36625	12, 16	-	EA	-
R	9-26-68	36861	1	-	EA	-
S	10-21-68	36934	2, 3, 15	-	EA	-
T	1-30-69	37271	1	-	EA	-
U	8-4-69	37718	2, 12, 16	-	EA	-
V	5-26-70	38114	2	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: 1. The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

2. Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

3. Refer to JDC 17104 for removal and replacement procedures when complete G & N System disassembly or component removal is to be accomplished.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM 0014A
Chg. 1 - 8-66

JOB G & N SYSTEM FOR TESTING

JDC 12201 REV V PAGE 2 OF 17

SUBSYSTEM G & N SYSTEM

ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054) or environmental gaskets
1	Navigation Base Assembly Sling and Handling Fixture
1	G & N System Equipment (2015000).
	Powder, Molybdenum Disulfide SCD 1008955 (Molykote powder)
1	Polyurethane foam cleanroom wiper

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 2.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

CAUTION: During the installation of assets the G&N Mounting Fixture may be positioned for convenience and accessibility. Use extreme care when tilting the G&N Mounting Fixture to insure that components do not strike cradle locking handles.

3. Tilt Cradle to a Horizontal position. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly.

4. Install three fixed memory rope modules and either one or three jumper modules in CGC as specified on Drawing 2021104 and as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

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JOB G & N SYSTEM FOR TESTING

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SUBSYSTEM G & N SYSTEM

ASSY

B1 Fixed Memory Module	B2 Fixed Memory Module
B3 Fixed Memory Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

Figure 1.

4A. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-25) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

5. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU as follows:

a. Visually inspect connectors 56P9 and 56P10 and the connectors on the CGC and CDU to insure that pins and sockets are not bent or damaged.

b. Carefully locate 56P10 on the guide pins of the CGC connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

e. Carefully locate 56P9 on the guide pins of the CDU connector, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

f. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

g. On the sides of the harness plug, tighten two captive screws and torque to 19±1 in-lbs.

7. Connectors 56P1 through 56P8 will be connected in a later step. Use some means to protect these connectors until they are connected.

8. Deleted.

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV V PAGE 4 OF 17

SUBSYSTEM G & N SYSTEM

ASSY

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF "B" Harness P6 to 45J4 on PSA.

NOTE: Before connecting any harness plugs visually inspect the pins and sockets to insure that they are not bent or damaged.

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position

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when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.) CAUTION: Always use disengagement tool specified in following step. Manual disengagement may cause connector damage.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

18. Place gasket on PSA connector 45J6 and connect plug 56P19 of "C" Harness to 45J6 as follows:

a. Carefully locate 56P19 on the guide pins of 45J6, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

19. Attach "B" Harness of the G and N Harness Assembly to the left hand wall of the G and N Fixture Cradle Assembly using four hinged loop clamps.

20. Place gasket on PSA connector 45J5 and connect plug 56P18 of "B" Harness to 45J5 as follows:

a. Carefully locate 56P18 on the guide pins of 45J5, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

21. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322).

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22. Place gasket on PSA connector 45J10 and connect plug 56P29 of "G" Harness to 45J10 as follows:

a. Carefully locate 56P29 on guide pins of 45J10, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

23. Attach "C" Harness to the left hand wall of the G and N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

24. Place gasket on PSA connector 45J8 and connect plug 56P27 of "H" Harness to 45J8 as follows:

a. Carefully locate 56P27 on guide pins of 45J8, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

25. Attach "G" Harness to the right hand wall using two clamps and bracket assemblies and two hinged loop clamps.

26. Place gasket on PSA connector 45J9 and connect plug 56P28 of "F" Harness to 45J9 as follows:

a. Carefully locate 56P28 on the guide pins of 45J9, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

28. Place gasket on PSA connector 45J7 and connect plug 56P26 of "E" Harness to 45J7 as follows:

a. Carefully locate 56P26 on guide pins of 45J7, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power
	A30J2	P1	W27 (1900871)	P2	J1	Console
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution
	J5	P1	W124 (2900380)	P4	J64	Box
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458) (2 required)			
Subsystem Mounting Fixture	E1					
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J8	GNF "E" Harness (2900666)
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J7	
	J7	P3		P4	P6	W259

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	Rotary Table
G and N Fixture Base	E1		W64 (1901676)			
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (W171) (2900753) ***	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA

Table I (Cont.)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCA, when applicable
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	
Temp Ind. (GBD)	A1J3	P1	W145 (2900589)	P2	J1	W171 (GNF "A" Harness)

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

*** GNF "A" Harness connection P4 to J1 of PSA coldplate must be connected after installation of PSA.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Place gasket on GNF "B" Harness connector J2 (on the back wall of the Cradle Assembly) and connect plug 56P17 of "D" Harness to J2 as follows:

a. Carefully locate 56P17 on guide pins of J2, ease the harness plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four jackscrews until finger tight.

b. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged torque each jackscrew to 19±1 in-lbs.

c. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs. Connect 56P1, P2, P3, P4, and P5 of the "A" Harness to connectors 56J1, J2, J3, J4, and J5 on connector bracket (2900935).

NOTE: Do not fasten hinged loop clamp on branch to P17 at this time.

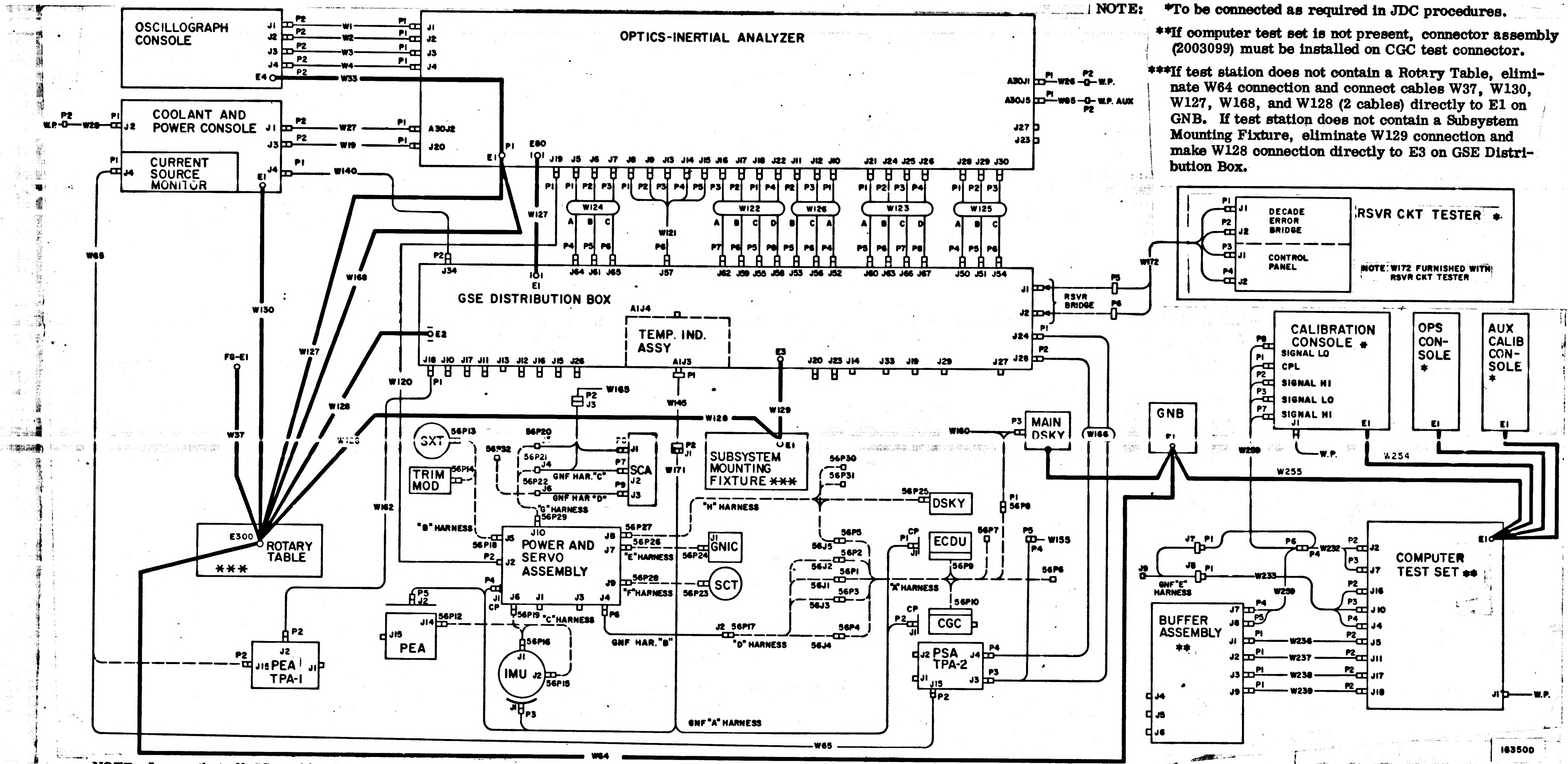
PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

NOTE: *To be connected as required in JDC procedures.

**If computer test set is not present, connector assembly (2003099) must be installed on CGC test connector.

***If test station does not contain a Rotary Table, eliminate W64 connection and connect cables W37, W130, W127, W168, and W128 (2 cables) directly to E1 on GNB. If test station does not contain a Subsystem Mounting Fixture, eliminate W129 connection and make W128 connection directly to E3 on GSE Distribution Box.


OSCILLOGRAPH CONSOLE
J1 J2 J3 J4 E4
W1 W2 W3 W4 W33
OPTICS-INERTIAL ANALYZER
A30J1 P1 W26 P2 W.P.
A30J5 P1 W65 P2 W.P. AUX
J27 J23
W.P. P2 W28 P1 J2
COOLANT AND POWER CONSOLE
W27 A30J2
W19 J20
CURRENT SOURCE MONITOR
J4 E1 W140
E1 P1 E80
J19 J5 J6 J7 J8 J9 J13 J14 J15 J16 J17 J18 J22 J11 J12 J10 J21 J24 J25 J26 J28 J29 J30
W124 W121 W122 W126 W123 W125
A B C D
J34 J64 J61 J65 J57 J62 J59 J55 J58 J53 J56 J52 J60 J63 J66 J67 J50 J51 J54
W65 W130 W168 W127 W120 W128 W162 W37
FG-E1
GSE DISTRIBUTION BOX
E2
A1J4
TEMP. IND. ASSY
A1J3
E3
J18 J10 J17 J11 J13 J12 J16 J15 J26 J20 J23 J14 J33 J19 J29 J27 J28 J24
W165 W146 W129 W171
RSVR BRIDGE
P5 P6 W172
DECADE ERROR BRIDGE
CONTROL PANEL
RSVR CKT TESTER *
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE *
SIGNAL LO
CPL
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CON-SOLE *
AUX CALIB CON-SOLE *
W.P.
W250 W254 W255
SXT 56P13
TRIM MOD 56P14
56P32 56P20 56P21 56P22
GNF HAR."C"
GNF HAR "D"
SCA
"G" HARNESS 56P29
SUBSYSTEM MOUNTING FIXTURE ***
"B" HARNESS
E300
ROTARY TABLE ***
POWER AND SERVO ASSEMBLY
56P18 56P27 56P26 56P28
GNIC 56P24
"E" HARNESS
SCT 56P23
"F" HARNESS
"H" HARNESS
56P30 56P31 56P25
DSKY
MAIN DSKY
W160 W166
GNB
56P8 56P7 56P5 56P2 56P1 56P3 56P4 56P6 56P9 56P10
56J5 56J2 56J1 56J3 56J4
ECDU
"A" HARNESS
CGC
W155
PEA 56P12
56P19 "C" HARNESS
56P16
IMU
56P15
GNF HAR. "B"
56P17 "D" HARNESS
PEA TPA-1
PSA TPA-2
GNF "A" HARNESS
W65
W64
COMPUTER TEST SET **
J7 J8 J9 GNF "E" HARNESS
W232 W233 W250
BUFFER ASSEMBLY **
W236 W237 W238 W239
J2 J7 J16 J10 J4 J5 J11 J17 J18 J1 E1
W.P.
163500

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G & N Mounting Fixture.

Figure 2

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

CAUTION: Use polyurethane foam cleanroom wiper to prevent coolant spillage on airborne equipment by wrapping wiper around quick-disconnect during mating and demating operations.

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See figure 4.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

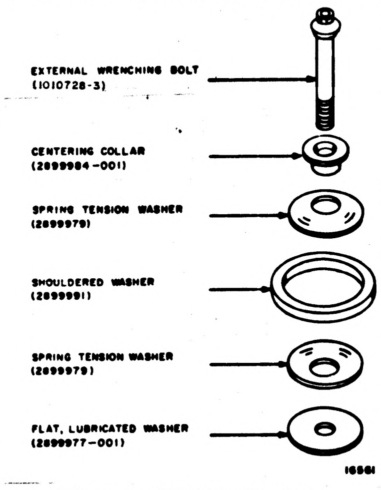

EXTERNAL WRENCHING BOLT (1010728-3)
CENTERING COLLAR (2899984-001)
SPRING TENSION WASHER (2899979)
SHOULDERED WASHER (2899981)
SPRING TENSION WASHER (2899979)
FLAT, LUBRICATED WASHER (2899977-001)
16561

Figure 3. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA Coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

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43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF DSKY

NOTE: Perform steps 50 and 51 if one or two DSKY's are being used for system tests.

50. Position DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

CAUTION: Use extreme care when installing connector to J9 on the DSKY to prevent pin damage. Adapter cables may be used on the DSKY connector J9 to facilitate harness connections and to prevent pin damage.

51. Connect 56P25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

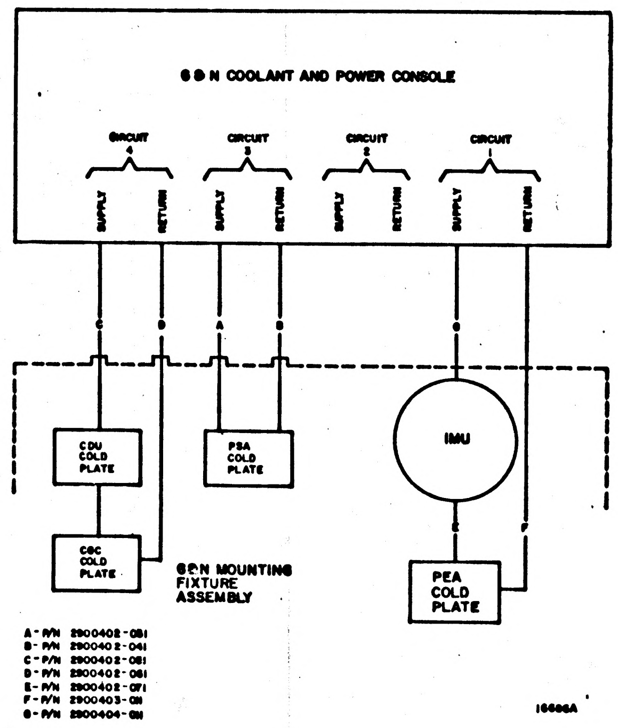

Figure 4.

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54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque tight (not to exceed 65 inch-pounds). Torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds. A torque wrench cannot be used because of space limitations so above torque requirement is for reference only.

56. Install all four Internal Wrenching bolts (1010727-1) and washers (1897006-063) to the right hand and left hand mount assemblies and torque tight (not to exceed 150 inch-pounds).

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place thin coating of Molykote powder on the mounting bolt threads. Wipe off all but a thin coating with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

69. Remove Plug Gage from the lower left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole, insert sleeve bushing (2021204), and insert mounting bolt (NAS 674V19). Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

CAUTION: Use polyurethane foam cleanroom wiper to prevent coolant spillage on airborne equipment by wrapping wiper around quick-disconnect during mating and demating operations.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU and connect coolant hoses to IMU.

NOTE: The following three steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY ON NAV BASE

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs. Set the G&N Mounting Fixture Tilt Axis to the required position to insure correct installation of precision balls in step 79.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 3. Tighten three bolts to 50-55 inch-pounds in 10 inch-pound increments, starting with SXT side, then SCT side, and then center. Back off the bolts approximately 75 degrees.

NOTE: Return G&N Mounting Fixture Tilt Axis to approximately 32.5°.

82. Connect 56P23 of "F" Harness and 56P13 of "B" Harness to Optics Assembly. Connect 56P14 of "B" Harness to 65A1J2 of Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 of "E" Harness to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

INSTALLATION OF SECOND DSKY

NOTE: Perform steps 87 and 88 only if two DSKY's are being used for system tests.

87. Position the DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

88. Connect P3 of cable W160 to the DSKY.

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV. - PAGE 1 OF 13

INITIAL TDRR 29882 D.S. PGS -

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Assembly of Guidance Components into a complete G & N System Test Configuration and preparation of GSE and G & N System for acceptance testing.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See below

IMPORTANT: The G & N System must be handled and installed with extreme care. It contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. A proper installation procedure and sequence is required to prevent possible damage or degradation of G & N System and components.

TOOLS AND MATERIAL: Acceptable results are contingent upon the use of equipment and material equivalent to that listed below. If protection to equipment and safety of personnel is not degraded, items equivalent to those recommended may be substituted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV - PAGE 2 OF 13

SUBSYSTEM G & N SYSTEM

ASSY

Item and number required	Description
1 Set	A set of torque wrenches with a range of 1 to 250 inch-pounds with adapters.
1 Set	Gaskets (FD 770054)
1	Navigation Base Assembly Sling and Handling Fixture.
1	G & N System Equipment (2015000).

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. A thorough visual examination of all GSE equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment and to cable bundles, harnesses and connectors.

B. PROCEDURES

NOTE: All directions given are for a technician facing south in front of the G & N Mounting Fixture. Insure that the IMU, PSA, CGC, CDU and PEA coldplates have been purged and filled. If not, refer to JDC 18045 for applicable procedures.

GSE-GSE PREPARATIONS

1. Place Prime Power Circuit breaker located on back of the OIA Console to the OFF position.

2. Insure that the cables indicated in Table 1 are connected, exceptions are indicated. (See Figure 1.) Insure that no other cables between the GSE Distribution Box and the GSE Consoles are connected.

INSTALLATION OF CGC AND CDU

3. Tilt Cradle to a Horizontal position.

4. Install the CGC to the coldplate on the lower right side of the Mounting Fixture with 14 hex-head screws (MS16996-24) and 28 flat washers, two for each screw, (AN-960C416L). Torque to 65-70 inch-pounds.

5. Remove G & N Cradle Support Plate (2900636) from Cradle Assembly. Install the CDU to the coldplate on the lower left side of the Mounting Fixture with 12 hex-head screws screws (MS16996-23) and 24 flat washers (AN960C416L). Torque to 65-70 inch-pounds.

6. Connect 56P10 of the "A" Harness to the CGC and 56P9 to the CDU.

7. Connect 56P1 through 56P5 to 56J1 through 56J5 on the connector bracket on the rear of the Mounting Fixture Cradle.

8. Connect 56P6, 56P7 and 56P8 to the connector bracket (2900936) on the right rear side of the Mounting Fixture Cradle with button-head screws (1006783-19) and hex nuts (1012525-002).

DATE ________

JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV - PAGE 3 OF 13

SUBSYSTEM G & N SYSTEM

ASSY

INSTALLATION OF CGC BUFFER ASSEMBLY

9. Remove Brackets (2900637) and (2900639) from G & N Cradle Support Plate.

10. Replace G & N Cradle Support Plate on bottom of Cradle Assembly.

11. Mount the Brackets to the Buffer Assembly with the captive hardware on Bracket.

12. Mount the Buffer Assembly and Brackets on the Cradle Assembly and connect ground strap.

13. Tilt Cradle Assembly to approximately 0°.

INSTALLATION OF PSA

14. Remove the PSA coldplate (2900725-021) from the Mounting Fixture Cradle Assembly.

15. Attach the coldplate to the PSA using captive hardware in coldplate. Torque to 20-25 inch-pounds.

16. Insert the PSA Coldplate Assembly in the Mounting Fixture Cradle Assembly and fasten with six hex-head cap screws (MS35308-322) and flat washers (AN960C446).

INSTALLATION OF G & N HARNESS ASSEMBLY

17. Connect GNF P6 to 45J4 on the PSA.

18. Connect 56P19 of the "C" Harness to 45J6 of the PSA using Gasket (FD770054) between connectors 56P19 and 45J6.

19. Attach "C" Harness to the left hand wall of the G & N Fixture Cradle Assembly using two hinged loop clamps and two loop clamps.

20. Connect 56P18 of the "B" Harness to 45J5 of the PSA using Gasket (FD 770054) between connectors 56P18 and 45J5.

21. Attach "B" Harness of the G & N Harness Assembly to the left hand wall of the G & N Fixture Cradle Assembly using four hinged loop clamps.

22. Connect 56P29 of the "G" Harness to 45J10 of the PSA using Gasket (FD 770054) between connectors 56P29 and 45J10.

23. Attach "G" Harness to the right hand wall using two clamp and bracket assemblies and two hinged loop clamps. Mate connectors P20, P21 and P22 to connectors GN F J5, GN F J4, and GN F J6.

24. Connect 56P27 of the "H" Harness to 45J8 of the PSA using Gasket (FD 770054) between connectors 56P27 and 45J8.

25. Attach "H" Harness to right hand wall using three hinged loop clamps. Feed connector J5 under rear wall and attach to connector bracket (2900935) using hex-head cap screws (MS35308-322) and hex nuts (1012525-002).

26. Connect 56P28 of the "F" Harness to 45J9 of the PSA using Gasket (FD 770054) between connectors 56P28 and 45J9.

27. Attach "F" Harness to right hand wall using two hinged loop clamps.

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JOB ASSEMBLY AND PREPARATION OF G & N SYSTEM FOR TESTING

JDC 12201 REV - PAGE 4 OF 13

SUBSYSTEM G & N SYSTEM

ASSY

Table 1

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1		W33 (1901404)		E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921) **	P2		Wall Power
	A30J5	P1	W85 (1901960) **	P2		Aux Wall Power
	E80		W127 (2900327)		E1	GSE Distribution Box
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	

DATE ________

Table 1 (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (Cont.)	J21	P1	W123 (2900379)	P5	J60	GSE Distribution Box (Cont.)
	J24	P2		P6	J63	
	J25	P3		P7	J66	
	J26	P4		P8	J67	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
GSE Distribution Box	E2		W128 (2900458)			
Current Source Monitor Panel	J4	P1	W65 (1900739) *	P2	J15 or J15	PSA TPA PEA TPA
CTS	J5	P2	W236 (2014463-011)	P1	J1	Buffer Assembly (2014254-011)
	J11	P2	W237 (2014462-011)	P1	J2	
	J17	P2	W238 (2014462-021)	P1	J3	
	J18	P2	W239 (2014462-031)	P1	J9	
	J1		Power (1014150-1)			Wall power
	J16	P2	W233 (2014483-011)	P1	J3	W161
	J10	P3				
	J4	P4				
	J2	P2	W232 (2014484-011)	P1	J2	
	J7	P3		P4	P6	W207

DATE ____________

Table I (Cont.)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
CGC Calibration Console *		P1	W259 (2014470-011)	P4	J7	Buffer Assembly (2014254-011)
		P2		P5	J8	
		P3				
		P7		P6	P4	W232
		P8				
Facility grd.			W37 (1901662)		E300	
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Subsystem Mounting Fixture	E1		W129 (2900459)		E3	GSE Distribution Box
CGC Calibration Console	E1		W254 (2014115-011)		E1	CTS
CTS	E1		W255 (2014115-021)		E1	G & N Fixture Base
W145	P2	J1	GNF "A" Harness (2900753)	P1	J1	CDU Coldplate
				P2	J1	CGC Coldplate
				P3	J1	IMU Coolant Line
				P4	J1	PSA Coldplate
				P5	J2	PEA Coldplate
GSE Distribution Box	J24	P1	W166 (2900671)	P3	J3	PSA TPA
	J28	P2		P4	J4	
				P5	P4	W155
	J18	P1	W162 (2900667)	P2	J2	PEA TPA
"G" Harness	P20	J5	GNF "C" Harness (2900924)	J3	P2	W165
	P21	J4		P7	J2	SCM
				P8	J1	
	P22	J6	GNF "D" Harness (2900925)	P9	J3	

NOTE: * Do not connect cable W65. This connection will be made later in accordance with specified procedures.

** Cable W26 must be connected before cable W85.

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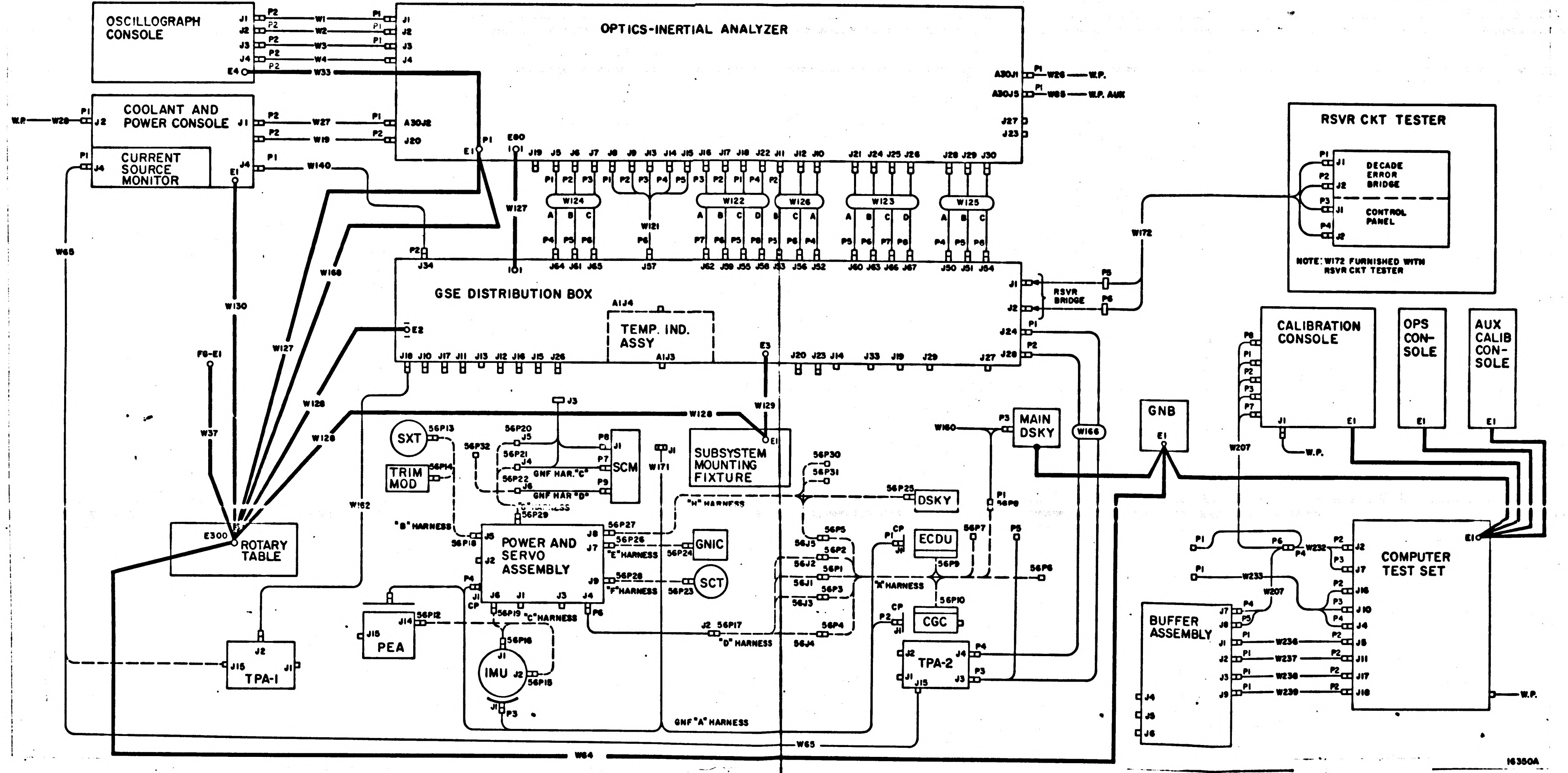
OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
W1
W2
W3
W4
W33
W27
W19
W140
W26 W.P.
W65 W.P. AUX
W29
W.P.
W124
W121
W122
W126
W123
W125
W127
W168
W130
W126
W128
W65
W37
W162
W129
W171
W172
W160
W166
W207
W64
GSE DISTRIBUTION BOX
TEMP. IND. ASSY
A1J4
A1J3
E2
E3
E80
RSVR BRIDGE
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE
OPS CONSOLE
AUX CALIB CONSOLE
GNB
MAIN DSKY
DSKY
SUBSYSTEM MOUNTING FIXTURE
SXT
TRIM MOD
SCM
GNF HAR."C"
GNF HAR."D"
"B" HARNESS
"H" HARNESS
"E" HARNESS
"F" HARNESS
"C" HARNESS
"D" HARNESS
"K" HARNESS
GNF "A" HARNESS
POWER AND SERVO ASSEMBLY
GNIC
SCT
ECDU
CGC
PEA
IMU
ROTARY TABLE
E300
F6-E1
TPA-1
TPA-2
COMPUTER TEST SET
BUFFER ASSEMBLY
W232
W233
W234
W237
W236
W238
W.P.
16350A

Figure 1.

DATE____________

28. Connect 56P26 to the "E" Harness to 45J7 of the PSA using Gasket (FD770054) between connectors 56P26 and 45J7.

29. Attach "E" Harness to right hand wall using two hinged loop clamps.

30. Fasten connectors J1, J2, J3 and J4 of "D" Harness to the connector bracket (2900935) on the rear of the G & N Holding Fixture Cradle Assembly using hardware on the bracket. Connect 56I 17 of the "D" Harness to connector GN F J2, on the back wall of the Cradle Assembly using Gasket (FD770054) between connectors 56P17 and GN F J2.

NOTE: Do not fasten hinged loop clamp on branch to P29 at this time.

PIPA ELECTRONICS ASSEMBLY INSTALLATION

31. Mount PIPA Electronics Assembly to coldplate on left wall of Mounting Fixture Cradle assembly with captive hardware on coldplate. Torque screws to 20-25 inch-pounds.

32. Connect 56P12 of the "C" Harness to 35A2J14 of the PIPA Electronics Assembly.

COOLANT LINE INSTALLATION

33. Place the IMU Coolant Inlet line (Circuit 1 Supply) through the left hand cutout in the back wall of the Cradle Assembly and position for connection to IMU. (See Figure 2.)

34. Fasten coolant line to the inner back wall with two hinged loop clamps (1010400-11) and underneath the Cradle Assembly on the left with one hinged loop clamp (1010400-11).

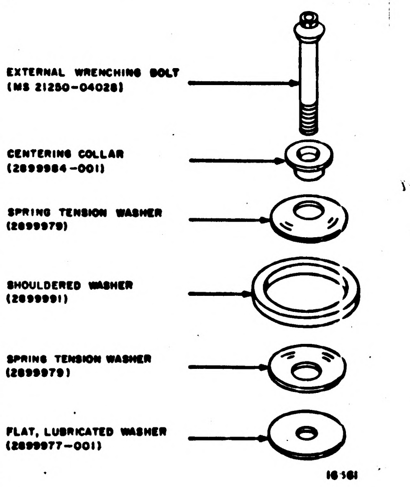

Figure 2. Mounting Hardware

35. Place the IMU Outlet-PEA Input Coolant line (Approximately 4 foot hose) through the cutout in the left hand rear wall of the Cradle Assembly and position for connection to the IMU. Fasten the coolant line to the inner left hand wall with one hinged loop clamp (1010400-11).

36. Connect the PEA Inlet coolant line to the inlet valve on the PEA coldplate.

37. Connect the PEA Outlet coolant line (Circuit 1 Return) to the outlet valve on the PEA.

38. Fasten the Inlet and Outlet lines of the PEA to the outer back wall of the Cradle Assembly with one hinged loop clamp (1010400-11).

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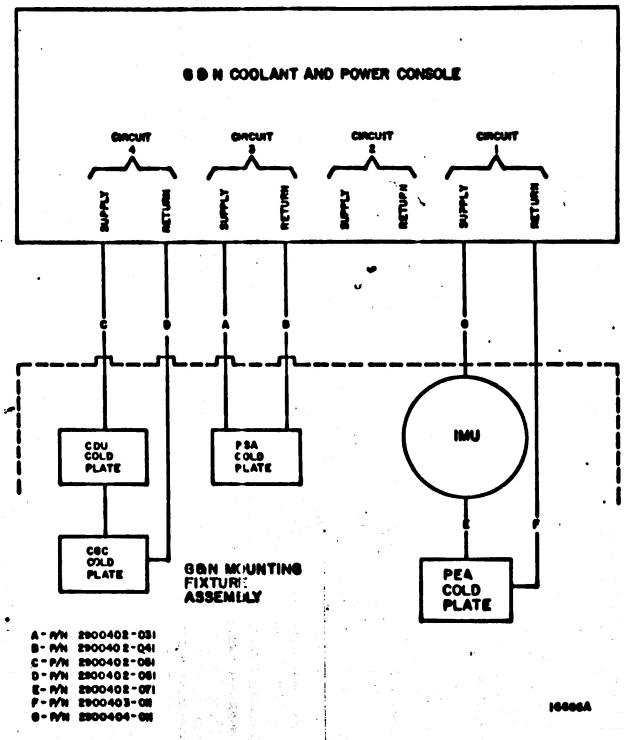

Figure 2.

DATE ______

39. Route the PSA Coolant Inlet line (Circuit 3 Supply) under the lower left side of the Cradle Assembly, across the back of the Cradle Assembly, through the inner right side and connect to the PSA coldplate inlet valve.

40. Fasten the coolant line to the back of the Cradle Assembly with two hinged loop clamps (1010400-1).

41. Fasten the coolant line to the right wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

42. Route the PSA coolant Outlet line (Circuit 3 Return), from the front, under the lower left side of the Cradle Assembly, through the left rear opening, out to the front of the PSA coldplate and connect to the PSA coldplate outlet valve.

43. Fasten the coolant line to the left wall of the Cradle Assembly with two hinged loop clamps (1010400-1).

44. Route the CDU/AGC coolant outlet line (Circuit 4 Return) from the front under the left side of the Cradle Assembly and connect to the outlet valve on the CGC coldplate.

45. Connect the CDU/AGC coolant jumper from the CGC Inlet valve to the CDU Outlet valve.

46. Route the CDU/AGC Inlet coolant line (Circuit 4 Supply) from the front under the left side of the Cradle Assembly and connect to the inlet valve on the CDU coldplate.

47. Fasten the CDU/AGC coolant Outlet, IMU/PEA coolant Outlet, PSA coolant Outlet, and CDU/AGC coolant Inlet lines to the left lower side of the Cradle Assembly with the Retaining Strap (1897193-001).

NAV BASE MOUNT INSTALLATION

48. Install the upper right base line Mounting Assembly (2899987-011) to right wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

49. Install upper left Nav Base Fixed Mounting Assembly (2899986-011) to left wall of Mounting Fixture Cradle with four hex-head cap screws (MS35308-332) and flat washers (AN960C516L). Torque to 120-140 inch-pounds.

INSTALLATION OF NAV DSKY

50. Position Nav DSKY and holding fixture in cutout on right hand side of cradle front panel assembly and attach with four captive screws. Torque screws finger tight.

51. Connect J25 of "H" Harness to DSKY connector and connect ground strap.

INSTALLATION OF NAV BASE

52. Set the G & N Fixture cradle against its 90° mechanical stop.

NOTE: Insure that the IMU and Optics mounting surfaces on the Nav Base are clean and free of burrs after removing protective pads.

53. Install the Nav Base Assembly to the

DATE ______

G & N Mounting Fixture taking care to avoid interference with the cable harnesses.

54. Install the Nav Base Plane Mounting Assembly (2899988-011) to lower rear Nav Base with Internal Wrenching bolts (1010727-003) and flat washers (1897006-053). Torque to 65-75 inch-pounds.

55. Install four hex-head cap screws (MS16996-23) and flat washers (AN960C416) to the Rear Mount Assembly and torque to 65-75 inch-pounds.

56. Install all four Internal Wrenching bolts (1010727-1) to the right hand and left hand Mount Assemblies and torque to 150-170 inch-pounds.

INSTALLATION OF IMU

57. Rotate G & N Cradle Assembly until the IMU mounting pads are horizontal. Insure that the Portable Temperature Controller is attached to the IMU and is operating properly. Insure that the extension cable is coiled neatly, with no tangles so that it can be played out smoothly. Allow the IMU outer shell to cool to ambient temperature for 1 hour before installing in the G & N Mounting Fixture.

58. Attach three eye bolts to the IMU. Attach the sling to the three eye bolts on the IMU.

59. Carefully hoist the IMU to a convenient level and remove protective mounting pads from the IMU.

60. Remove protective mounting pads from the Nav Base IMU mounting surfaces.

NOTE: Thoroughly examine the IMU and Nav Base mounting surfaces to insure that they are clean and free from burrs.

61. Remove the Snap-On Bellows from IMU.

62. Position the IMU above the Nav Base.

63. Transfer and lower the IMU into position so that the IMU mounting pads are approximately aligned with the Nav Base mounting pads.

64. Rotate the IMU until the IMU mounting pads are aligned with their respective Nav Base mounting pads. The IMU nameplate shall be positioned between the lower left and lower right mounting pads on the Nav Base (Facing the bottom of the Cradle Assembly).

65. Lower the IMU slowly insuring that the IMU mounting pads are aligned with the Nav Base mounting pads.

66. Insert Plug Gages (FA760330) through the upper and lower left IMU flange mounting holes and into the Nav Base mounting holes. Remove sling from IMU.

67. Place a light film of grease on the mounting bolt threads. Wipe off all but a thin film with a lint free cloth.

68. Leave Plug Gages in place and insert mounting bolts in upper and lower right mounting flange holes. Torque finger tight.

DATE ______

69. Remove Plug Gage from the lower left mounting flange hole and insert mounting bolt. Torque finger tight.

70. Remove Plug Gage from upper left mounting flange hole and insert mounting bolt. Torque finger tight.

71. Tighten the bolts to 30 inch-pounds and back off 1/4 turn.

72. Set the Tilt Axis of the G & N Mounting Fixture to approximately 32.5°.

73. Torque the four IMU bolts to 60-65 inch-pounds in 10 inch-pound increments in the following sequence: Torque the bolt in the hole in the upper left hand side, the bolt in the lower left, the bolt in the upper right and the bolt in the lower right.

74. Fasten connector 56P15 of the "C" Harness to J2 on the IMU.

NOTE: The following two steps must be accomplished within 15 minutes of each other.

75. Set the PTC power switch to OFF and disconnect PTC connector from J1 of the IMU and connect Cable W120 connector P2 to 45J2 on the PSA and connector P1 to J19 on the OIA.

76. Connect 56P16 of the "C" Harness to J1 of the IMU.

77. Set the Circuit Breakers on the rear of the OIA to ON.

78. Observe that the AUX HTR PWR lamp on the Temperature Monitor Control panel is lighted.

INSTALLATION OF OPTICS ASSEMBLY

NOTE: Insure that the Optics Mounting Surfaces on the Nav Base and the three precision balls are clean and free of burrs.

79. Place the three precision balls (NA1899967-001) in the three seats on the Nav Base Assembly with the holes in the precision balls vertical.

80. Carefully install the Optics Assembly on the Nav Base.

81. Secure the Optics Assembly to the Nav Base using the hardware indicated in Figure 2. Tighten, in numerical sequence, to 27 (±3) inch-pounds in approximately 10 inch-pound increments.

82. Connect 56P33 of the "F" Harness and 56P3 of the "B" Harness to the Optics Assembly. Connect 56P14 of the "B" Harness to 65A1J2 of the Optics Resolver Trim Module.

INSTALLATION OF OPTICS SHROUD ASSEMBLY AND OPTICS EYEPIECES

83. Obtain Optics Shroud Assembly and install on G & N Mounting Fixture. Torque six hex-head cap screws (MS16996-13) to 20-25 inch-pounds.

84. Obtain Optics eyepieces and install on Sextant and Telescope. Tighten both eyepieces finger tight.

INSTALLATION OF THE G & N INDICATOR CONTROL PANEL

85. Position the Indicator Control panel

DATE ________

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near its mounting surface on the G & N Mounting Fixture. Reach over the panel and mate connector 56P24 to connector 50J1.

86. Mount the G & N Indicator Control panel with six hex-head cap screws (MS16996-13). Torque the screws to 20-25 inch-pounds.

MAIN PANEL DSKY INSTALLATION

87. Position the MAIN DSKY and Holding Fixture in the Stand and attach with four captive screws. Torque screws finger tight. Connect ground straps.

DATE ________

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV. A PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30932	3	-	JP	-

REFERENCES

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Battery Operated Volt-Ohmmeter or Wheatstone Bridge

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV A PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
l.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 1 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV A PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

Table 2

NOTE: The cable interconnection specified to CTS are necessary only when performing JDC's. If these JDC's are not to be performed, it is not necessary to make the appropriate cable interconnection to the CTS.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19 J14	P2 P1	W155 (2900662)	P3 P4	P7 P5	G&N Harness W166
	J33	P1	W164 (2900669)	P2 P3	P30 P31	G&N Harness
	J13	P1	W163 (2900668)	P2	P32	G&N Harness
	J29	P2	W160 (2900665)	P1 P3	P8 05A3J1	G&N Harness Main DSKY
	J26	P1	W165 (2900670)	P2	J3	GNF "C" Harness
	A1J3	P1	W145 (2900589)	P2		W171
G&N Harness	P6	J1	GNF "E" Harness (2900666)	J3 J2	P1 P1	W233 W232
					E1	G & N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC		P4	W226 (2014137-011)	P1 P2 P3	J4 J5 J6	Buffer Assembly

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV A PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

JDC NO.	JOB
18000	Applying Inertial Signals via the Primary Signal Selector Panel
18001	Applying Reference Signals to the Dual Beam Oscilloscope via the Primary Signal Selector Panel
18202	Applying PSA Test Point Adapter Test Point Signals to the Digital Voltmeter, Phase Angle Voltmeter, and Duel Beam Oscilloscope
18003	Applying Auxiliary Signals via the Primary Signal Selector Panel
18204	Applying Auxiliary Coaxial Signals via the Coaxial Distribution Panel
18005	Voltage Measurement - Dual Beam Oscilloscope
18006	Phase Shift Measurements - Dual Beam Oscilloscope
18007	Time Measurements - Dual Beam Oscilloscope
18008	Frequency Measurements - Dual Beam Oscilloscope
18009	Lower Beam (B Scope, Channel 1) Pulse Monitoring - Dual Beam Oscilloscope
18010	Lower Beam (B Scope) Channel 1 and 2 Monitoring - Dual Beam Oscilloscope
18011	Applying Oscillograph Signals to the Dual Beam Oscilloscope
18012	DC Balance Calibration of Signal Generator
18013	Operation of the Signal Generator
18216	Voltage Measurement with the Current Source Monitor and Galvanometer Voltmeter or JDC 00160, Pulse Torque Electronics Tests
18017	Count Function - Counter
18018	E/UT XN_1 Function - Counter
18019	Ratio Function - Counter
18020	Period Function - Counter
18021	Test N_1 Function - Counter
18022	Test N_2 Function - Counter
18023	Operation of Oscillograph Console (Electric)
18024	Operation of Oscillograph Console (Ink)

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV A PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

JDC NO.	JOB
18025	Calibration of DC Amplifier - Oscillograph
18026	Operation of DC Amplifiers - Oscillograph
18027	Normal Calibration (800 CPS Reference) of the Phase Sensitive Demodulator - Oscillograph
18028	Normal Calibration (3200 CPS Reference) of the Phase Sensitive Demodulator - Oscillograph
18029	Periodic Phase Shift Check and Calibration (800 CPS Reference) of the Phase Sensitive Demodulator-Oscillograph
18031	Operation of the Phase Sensitive Demodulator-Oscillograph
18032	Ink Cartridge Installation - Oscillograph
18033	Pen Installation - Oscillograph
18034	Change Paper - Oscillograph
18035	DC Voltage Measurement - Digital Voltmeter
18036	AC Voltage Measurement - Digital Voltmeter
18037	Automatic Measurement of an AC or DC Voltage - Digital Voltmeter
18038	Measurement of a Total RMS Voltage - Phase Angle Voltmeter
18039	Measurement of a Fundamental RMS Component - Phase Angle Voltmeter
18040	Measurement of a Phase Angle - Phase Angle Voltmeter
18041	Measurement of In-Phase and Quadrature Components - Phase Angle Voltmeter
18042	Indication of a Phase Sensitive Null - Phase Angle Voltmeter
18043	Operation of the Digital Recorder
18244	Gimbal Position Control Panel Operation and Calibration (Inertial Subsystem Test Only)
18045	Operation of Purging and Filling Fixture
18046	C & N Coolant and Power Console Operation and Interconnections
18049	Maintain and Monitor IMU Heat Using ICTC
18050	Auxiliary Input Panel Use and Operation
18103	Applying Auxiliary Signals via the Primary Signal Selector Panel
18104	Applying Signals to the Dual Beam Oscilloscope via the Auxiliary Input Panel
18249	Maintain and Monitor IMU Using Portable Temperature Controller
18260	Performance Verification of the Digital Voltmeter
18261	Performance Verification of the Phase Angle Voltmeter

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PREPARE GSE FOR G & N SYSTEM

JOB ACCEPTANCE TESTING	JDC 12202 REV A PAGE 6 OF 6
SUBSYSTEM G & N SYSTEM	ASSY

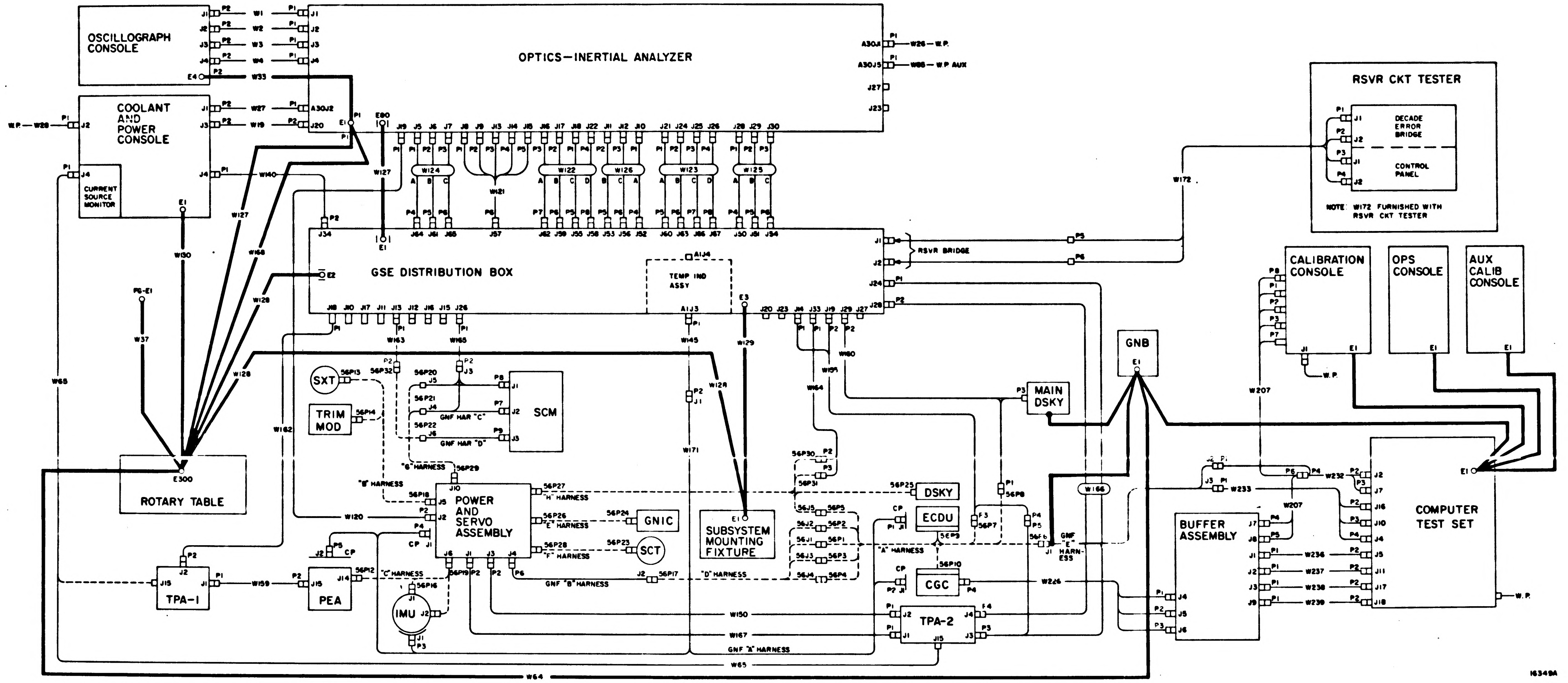
OSCILLOGRAPH CONSOLE
OPTICS—INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP IND ASSY
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE
OPS CONSOLE
AUX CALIB CONSOLE
GNB
MAIN DSKY
COMPUTER TEST SET
BUFFER ASSEMBLY
ROTARY TABLE
E300
SXT
TRIM MOD
SCM
POWER AND SERVO ASSEMBLY
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
TPA-1
PEA
IMU
TPA-2
"B" HARNESS
"G" HARNESS
"H" HARNESS
"E" HARNESS
"F" HARNESS
"C" HARNESS
"D" HARNESS
"A" HARNESS
GNF "B" HARNESS
GNF "A" HARNESS
GNF HAR "C"
GNF HAR "D"
GNF "E" HARNESS
W64
W65
W66
W120
W150
W159
W167
W226
W166
W172
W207
16349A

Figure 1. Cable Connections

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. A
INITIAL TDRR 29382

JOB ______

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______

NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. A

JOB ______

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT: Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.	REJECTED	ACCEPTED
REMARKS:		

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. A

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. A

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				▨		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV. B PAGE 1 OF 9
INITIAL TDRR 29882 D.S. PGS 4
SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30932	3	-	JP	-
B	10-13-66	31507	4 - 8	-	EA	-

REFERENCES

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Battery Operated Volt-Ohmmeter or Wheatstone Bridge

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV B PAGE 2 OF 9
SUBSYSTEM G & N SYSTEM
ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
l.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 1 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV B PAGE 3 OF 9
SUBSYSTEM G & N SYSTEM
ASSY

Table 2

NOTE: The cable interconnection specified to CTS are necessary only when performing JDC's. If these JDC's are not to be performed, it is not necessary to make the appropriate cable interconnection to the CTS.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19 J14	P2 P1	W155 (2900662)	P3 P4	P7 P5	G&N Harness W166
	J33	P1	W164 (2900669)	P2 P3	P30 P31	G&N Harness
	J13	P1	W163 (2900668)	P2	P32	G&N Harness
	J29	P2	W160 (2900665)	P1 P3	P8 05A3J1	G&N Harness Main DSKY
	J26	P1	W165 (2900670)	P2	J3	GNF "C" Harness
	A1J3	P1	W145 (2900589)	P2		W171
G&N Harness	P6	J1	GNF "E" Harness (2900666)	J3 J2	P1 P1	W233 W232
					E1	G & N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC		P4	W226 (2014137-011)	P1 P2 P3	J4 J5 J6	Buffer Assembly

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV B PAGE 4 OF 9
SUBSYSTEM G & N SYSTEM
ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021
	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043

DATE 30 JUN 66

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV B PAGE 5 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008
	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005

DATE ________

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV B PAGE 6 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18052
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
Inertial components temperature controller	Provide IMU heat	18049
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028
	Applying signals to dual beam oscilloscope, scope "B," channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034
	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268

DATE ________

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV B PAGE 7 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104
	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005

DATE ________

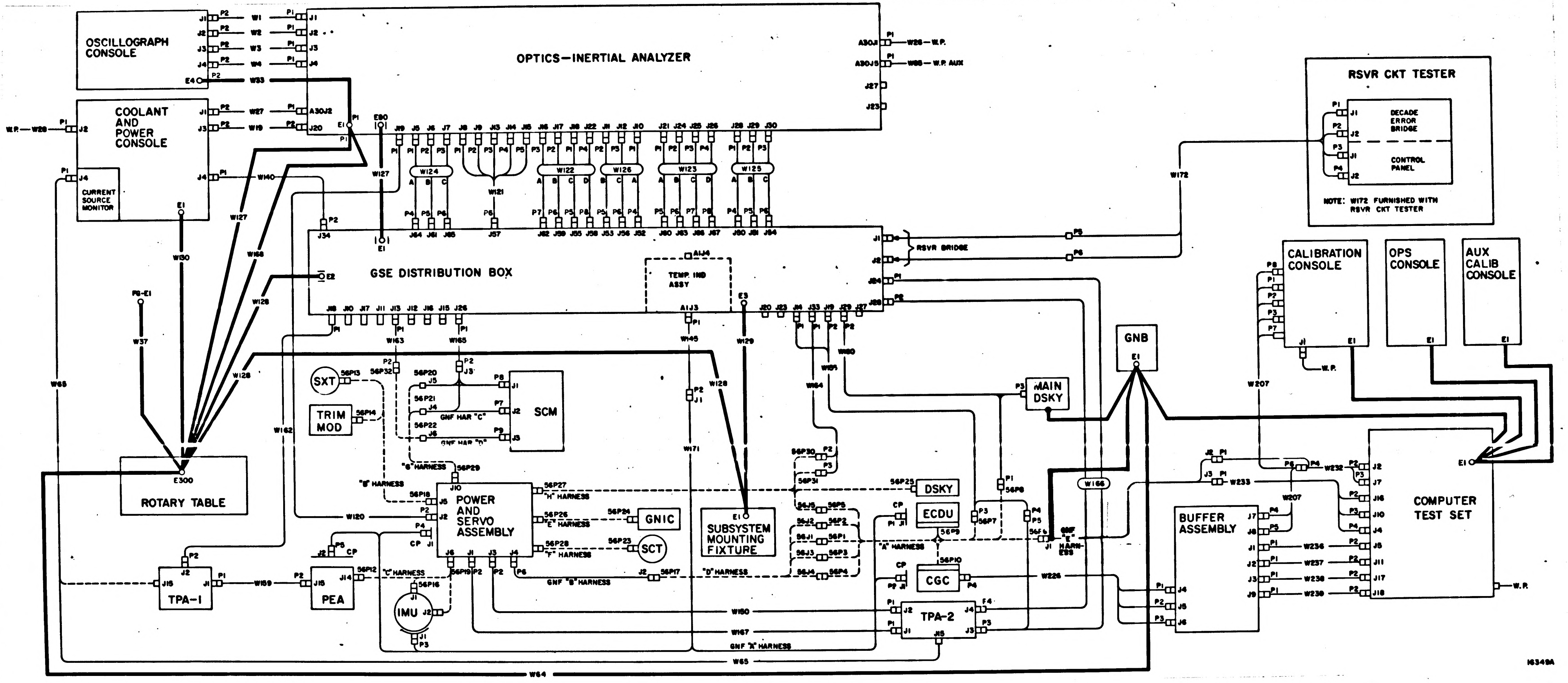
PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV B PAGE 8 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013

DATE ________

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV B PAGE 9 OF 9
SUBSYSTEM G & N SYSTEM | ASSY



OSCILLOGRAPH CONSOLE
OPTICS—INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
GSE DISTRIBUTION BOX
TEMP IND ASSY
RSVR BRIDGE
CALIBRATION CONSOLE
OPS CONSOLE
AUX CALIB CONSOLE
GNB
MAIN DSKY
SXT
TRIM MOD
SCM
GNF HAR "C"
GNF HAR "D"
"G" HARNESS
"B" HARNESS
"H" HARNESS
"E" HARNESS
"F" HARNESS
"C" HARNESS
"D" HARNESS
"A" HARNESS
GNF "B" HARNESS
GNF "A" HARNESS
GNF "E" HARNESS
POWER AND SERVO ASSEMBLY
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
ROTARY TABLE
E300
TPA-1
PEA
IMU
TPA-2
BUFFER ASSEMBLY
COMPUTER TEST SET
W1
W2
W3
W4
W33
W27
W19
W28
W26 — W.P.
W66 — W.P. AUX
W140
W127
W168
W126
W128
W37
W65
W64
W150
W120
W162
W121
W122
W124
W125
W126
W123
W163
W165
W145
W171
W129
W184
W181
W180
W166
W172
W207
W232
W233
W234
W237
W238
W239
W226
W159
W160
W167
W.P.
16349A

Figure 1. Cable Connections

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. B
INITIAL TDRR 29882

JOB

ASSEMBLY UNDER TEST

TITLE
SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. B

JOB

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT: Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.	REJECTED	ACCEPTED
REMARKS:		

DATE 30 JUN 66

FORM 00148
Chg. 7-23-65.

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. B

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 00150
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. B

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				▨		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 00150
Chg. 7-23-65

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV. C PAGE 1 OF 9 INITIAL TDRR 29882 D.S. PGS 4
SUBSYSTEM G & N SYSTEM	ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	9-1-66	30932	3	-	JP	-
B	10-13-66	31507	4 - 8	-	EA	-
C	11-10-66	31884	9	4	EA	-

REFERENCES

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Battery Operated Volt-Ohmmeter or Wheatstone Bridge

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV C PAGE 2 OF 9
SUBSYSTEM G & N SYSTEM	ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
l.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 1 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV C PAGE 3 OF 9
SUBSYSTEM G & N SYSTEM	ASSY

Table 2

NOTE: The cable interconnection specified to CTS are necessary only when performing JDC's. If these JDC's are not to be performed, it is not necessary to make the appropriate cable interconnection to the CTS.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19	P2	W155 (2900662)	P3	P7	G&N Harness
	J14	P1		P4	P5	W166
	J33	P1	W164 (2900669)	P2 P3	P30 P31	G&N Harness
	J13	P1	W163 (2900668)	P2	P32	G&N Harness
	J29	P2	W160 (2900665)	P1	P8	G&N Harness
				P3	05A3J1	Main DSKY
	J26	P1	W165 (2900670)	P2	J3	GNF "C" Harness
	A1J3	P1	W145 (2900589)	P2		W171
G&N Harness	P6	J1	GNF "E" Harness (2900666)	J3	P1	W233
				J2	P1	W232
					E1	G & N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC		P4	W226 (2014137-011)	P1	J4	Buffer Assembly
				P2	J5	
				P3	J6	

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV C PAGE 4 OF 9
SUBSYSTEM G & N SYSTEM	ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021
	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV C PAGE 5 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008
	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005

DATE ________

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV C PAGE 6 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18052
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
Inertial components temperature controller	Provide IMU heat	18049
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028
	Applying signals to dual beam oscilloscope, scope "B," channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034
	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268

DATE ________

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV C PAGE 7 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104
	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005

DATE ________

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV C PAGE 8 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

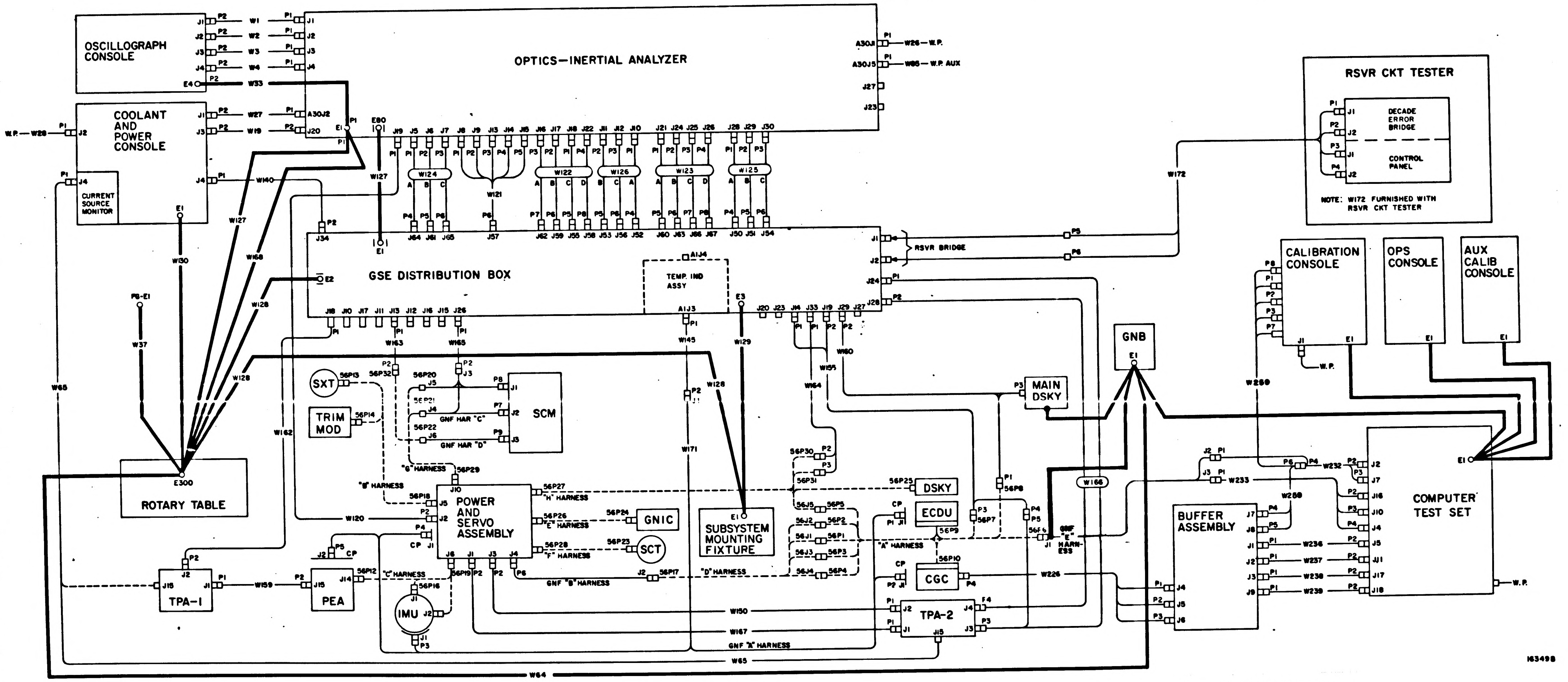
INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013

DATE ________

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV C PAGE 9 OF 9

SUBSYSTEM G & N SYSTEM | ASSY



OSCILLOGRAPH CONSOLE
OPTICS—INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP IND ASSY
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE
OPS CONSOLE
AUX CALIB CONSOLE
GNB
MAIN DSKY
COMPUTER TEST SET
BUFFER ASSEMBLY
SXT
TRIM MOD
SCM
GNF HAR "C"
GNF HAR "D"
"G" HARNESS
"B" HARNESS
POWER AND SERVO ASSEMBLY
"H" HARNESS
"C" HARNESS
"F" HARNESS
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
"A" HARNESS
"D" HARNESS
GNF "B" HARNESS
GNF "K" HARNESS
"E" HARNESS
ROTARY TABLE
TPA-1
PEA
IMU
TPA-2
W.P.
W.P. AUX
E300
W1
W2
W3
W4
W33
W26
W27
W19
W20
W64
W65
W66
W120
W124
W121
W122
W126
W123
W125
W127
W128
W129
W130
W140
W145
W150
W155
W159
W160
W162
W163
W164
W165
W166
W167
W168
W171
W172
W226
W232
W233
W236
W237
W238
W239
W260
W37
163498

Figure 1. Cable Connections

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. C
INITIAL TDRR 29382

JOB ____________

ASSEMBLY UNDER TEST	**TEST HISTORY**
TITLE ____________	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ____	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE
NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. C

JOB ____________

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT:	REJECTED	ACCEPTED
Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.		
REMARKS:		

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. C

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. C

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				25		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV. D PAGE 1 OF 9 INITIAL TDRR 29882 D.S. PGS 4
SUBSYSTEM G & N SYSTEM	ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	9-1-66	30932	3	-	JP	-
B	10-13-66	31507	4 - 8	-	EA	-
C	11-10-66	31884	9	4	EA	-
D	11-17-66	31961	6, 7, 8	-	EA	-

REFERENCES

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Battery Operated Volt-Ohmmeter or Wheatstone Bridge

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV D PAGE 2 OF 9
SUBSYSTEM G & N SYSTEM	ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
l.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 1 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV D PAGE 3 OF 9
SUBSYSTEM G & N SYSTEM	ASSY

Table 2

NOTE: The cable interconnection specified to CTS are necessary only when performing JDC's. If these JDC's are not to be performed, it is not necessary to make the appropriate cable interconnection to the CTS.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19 J14	P2 P1	W155 (2900662)	P3 P4	P7 P5	G&N Harness W166
	J33	P1	W164 (2900669)	P2 P3	P30 P31	G&N Harness
	J13	P1	W163 (2900668)	P2	P32	G&N Harness
	J29	P2	W160 (2900665)	P1 P3	P8 05A3J1	G&N Harness Main DSKY
	J26	P1	W165 (2900670)	P2	J3	GNF "C" Harness
	A1J3	P1	W145 (2900589)	P2		W171
G&N Harness	P6	J1	GNF "E" Harness (2900666)	J3 J2	P1 P1	W233 W232
					E1	G & N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC		P4	W226 (2014137-011)	P1 P2 P3	J4 J5 J6	Buffer Assembly

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC12202 REV D PAGE 4 OF 9
SUBSYSTEM G & N SYSTEM	ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021
	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV D PAGE 5 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	19008
	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005

DATE ______

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV D PAGE 6 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18052
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028
	Applying signals to dual beam oscilloscope, scope "B," channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV D PAGE 7 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of Chart Speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	Performance verification	19253
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104

DATE 30 JUN 66

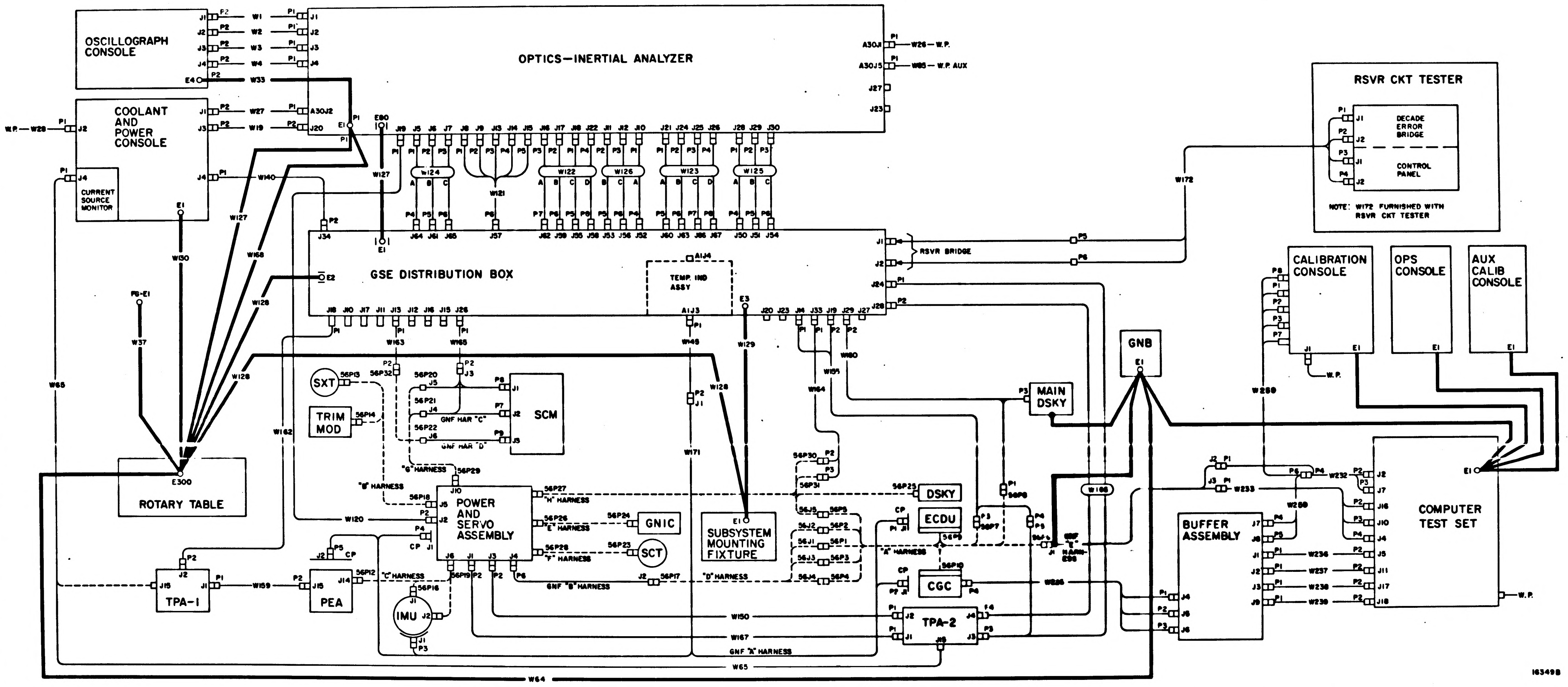
JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV D PAGE 8 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel (cont)	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

DATE 30 JUN 66


OSCILLOGRAPH CONSOLE
OPTICS—INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
W26—W.P.
W85—W.P. AUX
W.P.—W29
W1
W2
W3
W4
W33
W27
W19
W140
W127
W68
W128
W126
W30
W37
P6-E1
W172
GSE DISTRIBUTION BOX
TEMP. IND ASSY
RSVR BRIDGE
W124
W121
W122
W126
W123
W125
CALIBRATION CONSOLE
OPS CONSOLE
AUX CALIB CONSOLE
GNB
MAIN DSKY
W163
W165
W148
W129
W151
W164
W150
W171
SXT
TRIM MOD
SCM
GNF HAR "C"
GNF HAR "D"
"G" HARNESS
"B" HARNESS
"H" HARNESS
"E" HARNESS
"F" HARNESS
"D" HARNESS
"A" HARNESS
GNF "B" HARNESS
GNF "A" HARNESS
"C" HARNESS
POWER AND SERVO ASSEMBLY
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
W166
W120
W162
W65
ROTARY TABLE
E300
TPA-1
W159
PEA
IMU
TPA-2
W150
W167
W64
W65
BUFFER ASSEMBLY
W232
W233
W269
W236
W237
W238
W239
W235
COMPUTER TEST SET
W.P.
163498

NOTE: W172 FURNISHED WITH RSVR CKT TESTER

Figure 1. Cable Connections

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. D
INITIAL TDRR 29982

JOB ____________

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE

NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION

APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. D

JOB ____________

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT:	REJECTED	ACCEPTED
Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.		
REMARKS:		

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. D

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. D

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				25		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV. E PAGE 1 OF 9
INITIAL TDRR 29882 D.S. PGS 4
SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30932	3	-	JP	-
B	10-13-66	31507	4 - 8	-	EA	-
C	11-10-66	31884	9	4	EA	-
D	11-17-66	31961	6, 7, 8	-	EA	-
E	7-20-67	34175	3, 9	1, 2	SB	-

REFERENCES

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Battery Operated Volt-Ohmmeter or Wheatstone Bridge

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV E PAGE 2 OF 9
SUBSYSTEM G & N SYSTEM
ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
l.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 1 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV E PAGE 3 OF 9
SUBSYSTEM G & N SYSTEM
ASSY

Table 1

NOTE: Connection of cable W226 between the buffer assembly and the CGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the CGC test connector, insure that connector assembly (2900924) is installed on the CGC test connector.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19	P2	W155 (2900662)	P3	P7	G&N Harness
	J14	P1		P4	P5	W166
	J33	P1	W164 (2900669)	P2 P3	P30 P31	G&N Harness
	J13	P1	W163 (2900668)	P2	P32	G&N Harness
	J29	P2	W160 (2900665)	P1 P3	P8 05A3J1	G&N Harness Main DSKY
	J26	P1	W165 (2900670)	P2	J3	GNF "C" Harness
	A1J3	P1	W145 (2900589)	P2	J1	W171
G&N Harness	P6	J1	GNF "E" Harness (2900666)	J3 J2	P1 P1	W233 W232
					E1	G & N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC (See NOTE above)		P1	W226 (2014137-011)	P2 P3 P4	J4 J5 J6	Buffer Assembly

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SUBSYSTEM G & N SYSTEM
ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021
	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043

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INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008
	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005

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PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV E PAGE 6 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18052
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028
	Applying signals to dual beam oscilloscope, scope "B," channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034

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PREPARE GSE FOR G & N SYSTEM
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SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Operation of dc amplifiers	18020
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of Chart Speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	Performance verification	19253
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104

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INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel (cont)	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

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PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING

JDC 12202 REV E PAGE 9 OF 9

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: *Connections required only when specified in JDC's being performed.

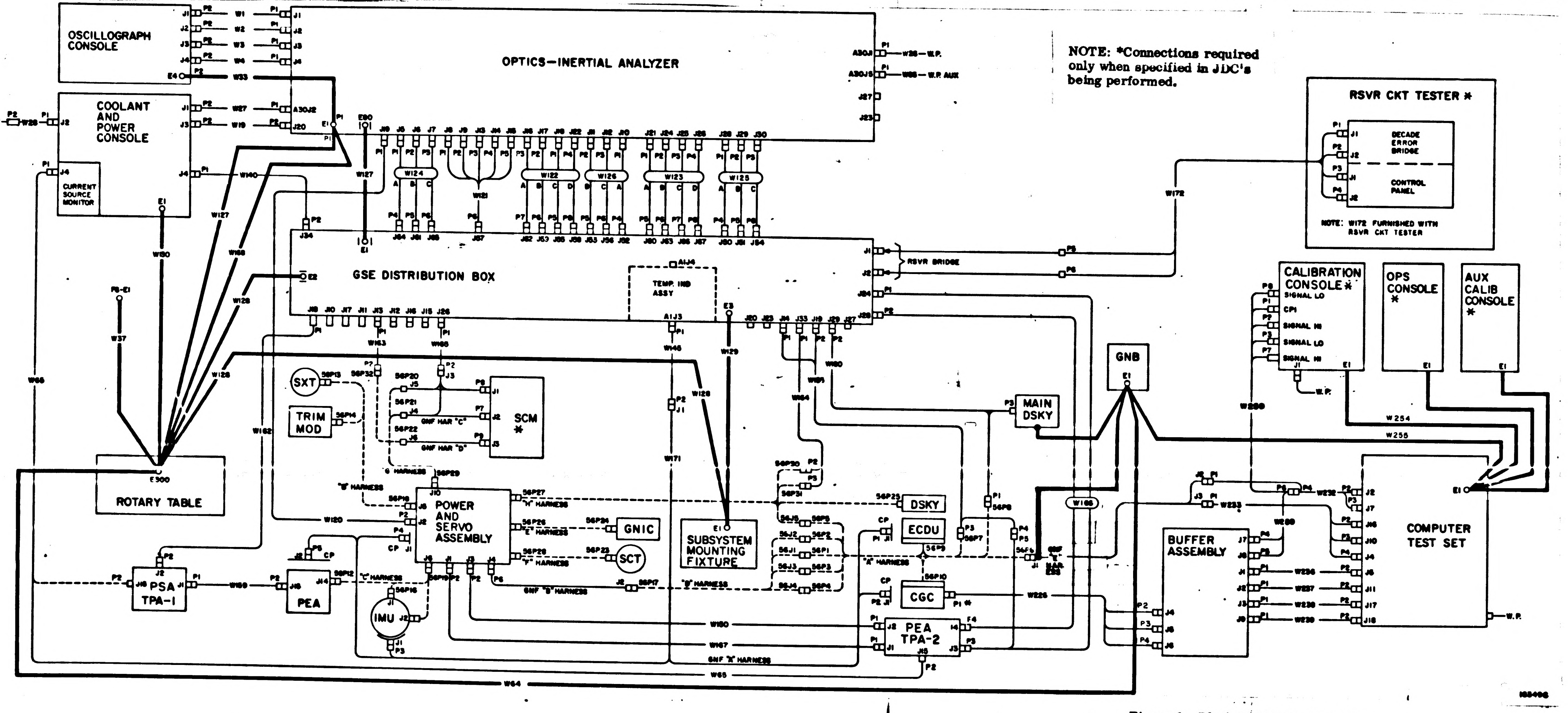
OSCILLOGRAPH CONSOLE
OPTICS—INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
GSE DISTRIBUTION BOX
TEMP IND ASSY
RSVR BRIDGE
CALIBRATION CONSOLE *
SIGNAL LO
SIGNAL HI
OPS CONSOLE *
AUX CALIB CONSOLE *
GNB
MAIN DSKY
SXT
TRIM MOD
SCM *
ROTARY TABLE
E300
POWER AND SERVO ASSEMBLY
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
PSA TPA-1
PEA
IMU
PEA TPA-2
BUFFER ASSEMBLY
COMPUTER TEST SET
W124
W122
W126
W123
W125
W121
W127
W140
W168
W128
W150
W37
W66
W162
W163
W165
W146
W129
W171
W164
W161
W160
W172
W254
W255
W259
W233
W165
W225
W236
W237
W238
W239
W180
W167
W65
W64
GNF HAR "C"
GNF HAR "D"
"B" HARNESS
"H" HARNESS
"E" HARNESS
"F" HARNESS
"C" HARNESS
GNF "G" HARNESS
"K" HARNESS
"A" HARNESS
GNF "A" HARNESS
W.P.
W.P. AUX
165498

Figure 1. Block II G&N Configuration

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. E
INITIAL TDRR 29182

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. E

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT: Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.	REJECTED	ACCEPTED
REMARKS:		

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. E

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

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[illegible]

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. E

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				25		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

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FORM [illegible]
Chg [illegible]

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING

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INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30932	3	-	JP	-
B	10-13-66	31507	4 - 8	-	EA	-
C	11-10-66	31884	9	4	EA	-
D	11-17-66	31961	6, 7, 8	-	EA	-
E	7-20-67	34175	3, 9	1, 2	SB	-
F	8-24-67	34431	3, 9	-	EA	-

REFERENCES

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Battery Operated Volt-Ohmmeter or Wheatstone Bridge

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING

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SUBSYSTEM G & N SYSTEM
ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
1.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 1 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

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SUBSYSTEM G & N SYSTEM
ASSY

Table 1

NOTE: Connection of cable W226 between the buffer assembly and the CGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the CGC test connector, insure that connector assembly (2003099) is installed on the CGC test connector.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19 J14	P2 P1	W155 (2900662)	P3	P7	"A" Harness
	J33	P1	W164 (2900669)	P2 P3	P30 P31	"H" Harness
	J13	P1	W163 (2900668)	P2	P32	"G" Harness
	J29	P2	W160 (2900665)	P1	P8	"A" Harness
	J26	P1	W165 (2900670)			
GNF "E" Harness	J1	P6	"A" Harness			
					E1	G&N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC (See NOTE above)		P1	W226 (2014137-011)	P2 P3 P4	J4 J5 J6	Buffer Assembly

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SUBSYSTEM G & N SYSTEM
ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021
	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043

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JOB ACCEPTANCE TESTING | JDC 12202 REV F PAGE 5 OF 9
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INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008
	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005

DATE ______

FORM 00145
Chg. 7-23-65

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV F PAGE 6 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18052
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028
	Applying signals to dual beam oscilloscope, scope "B," channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034

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PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV F PAGE 7 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of Chart Speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	Performance verification	19253
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104

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PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV F PAGE 8 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel (cont)	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

DATE 30 JUN 66

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV F PAGE 9 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

NOTE: *Connections required only when specified in JDC's being performed.

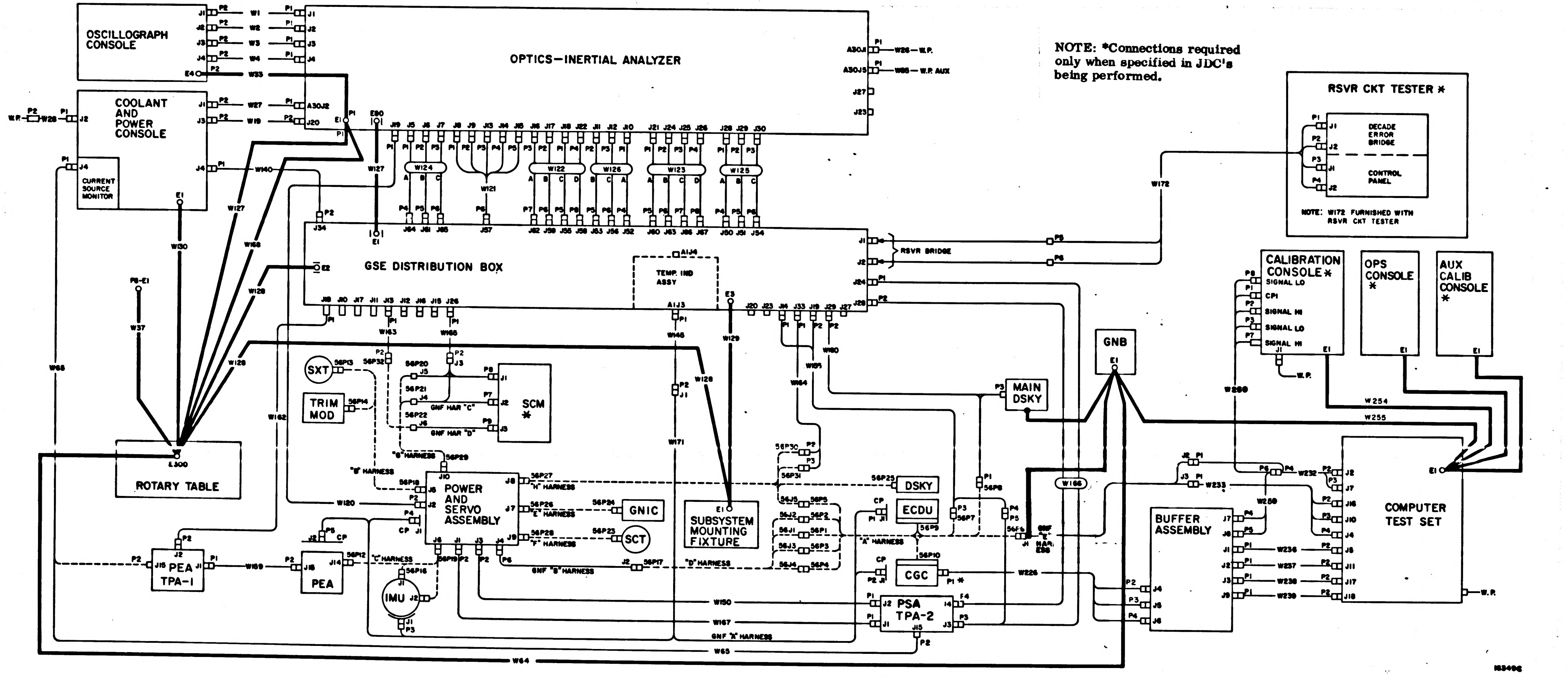
OSCILLOGRAPH CONSOLE
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
OPTICS—INERTIAL ANALYZER
GSE DISTRIBUTION BOX
TEMP. IND ASSY
RSVR BRIDGE
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE *
SIGNAL LO
CPI
SIGNAL HI
OPS CONSOLE *
AUX CALIB CONSOLE *
GNB
MAIN DSKY
ROTARY TABLE
SXT
TRIM MOD
SCM *
GNF HAR "C"
GNF HAR "D"
"B" HARNESS
"G" HARNESS
POWER AND SERVO ASSEMBLY
"H" HARNESS
"E" HARNESS
"F" HARNESS
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
"A" HARNESS
"D" HARNESS
GNF "B" HARNESS
GNF "A" HARNESS
"C" HARNESS
PEA TPA-1
PEA
IMU
PSA TPA-2
BUFFER ASSEMBLY
COMPUTER TEST SET
W1
W2
W3
W4
W33
W27
W19
W26
W88
W127
W140
W130
W37
W65
W128
W126
W162
W120
W159
W124
W121
W122
W126
W123
W125
W163
W165
W145
W129
W171
W164
W161
W160
W172
W166
W254
W255
W280
W232
W233
W250
W236
W237
W238
W239
W226
W150
W167
W65
W64
W.P.
W.P. AUX

Figure 1. Block II G&N Configuration

DATE 19 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. F
INITIAL TDRR 29982

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION   APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. F

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT:	REJECTED	ACCEPTED
Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.		
REMARKS:		

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. F

JOB PREPARE GSF FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. F

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				25		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV. G PAGE 1 OF 9
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30932	3	-	JP	-
B	10-13-66	31507	4 - 8	-	EA	-
C	11-10-66	31884	9	4	EA	-
D	11-17-66	31961	6, 7, 8	-	EA	-
E	7-20-67	34175	3, 9	1, 2	SB	-
F	8-24-67	34431	3, 9	-	EA	-
G	2-2-68	35558	3	-	EA	-

REFERENCES

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Battery Operated Volt-Ohmmeter or Wheatstone Bridge

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV G PAGE 2 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A .	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
l.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 1 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV G PAGE 3 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

Table 1

NOTE: Connection of cable W226 between the buffer assembly and the CGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the CGC test connector, insure that connector assembly (2003099) is installed on the CGC test connector.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19	P2	W155 (2900662)	P3	P7	"A" Harness
	J14	P1				
	J33	P1	W164 (2900669)	P2	P30	"H" Harness
				P3	P31	
	J13	P1	W163 (2900668)	P2	P32	"G" Harness
	J29	P2	W160 (2900665)	P1	P8	"A" Harness
	J26	P1	W165 (2900670)			
GNF "E" Harness	J1	P6	"A" Harness			
					E1	G&N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC (See NOTE above)		P1	W226 (2014137-011)	P2	J4	Buffer Assembly
				P3	J5	
				P4	J6	

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G&N Mounting Fixture.

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV G PAGE 4 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events.	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021
	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV G PAGE 5 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008
	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005

DATE ______

FORM 00145
Chg. 7-23-65

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV G PAGE 6 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18052
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028
	Applying signals to dual beam oscilloscope, scope "B," channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV G PAGE 7 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of Chart Speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	Performance verification	19253
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV G PAGE 8 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel (cont)	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

DATE 30 JUN 66

NOTE: *Connections required only when specified in JDC's being performed.

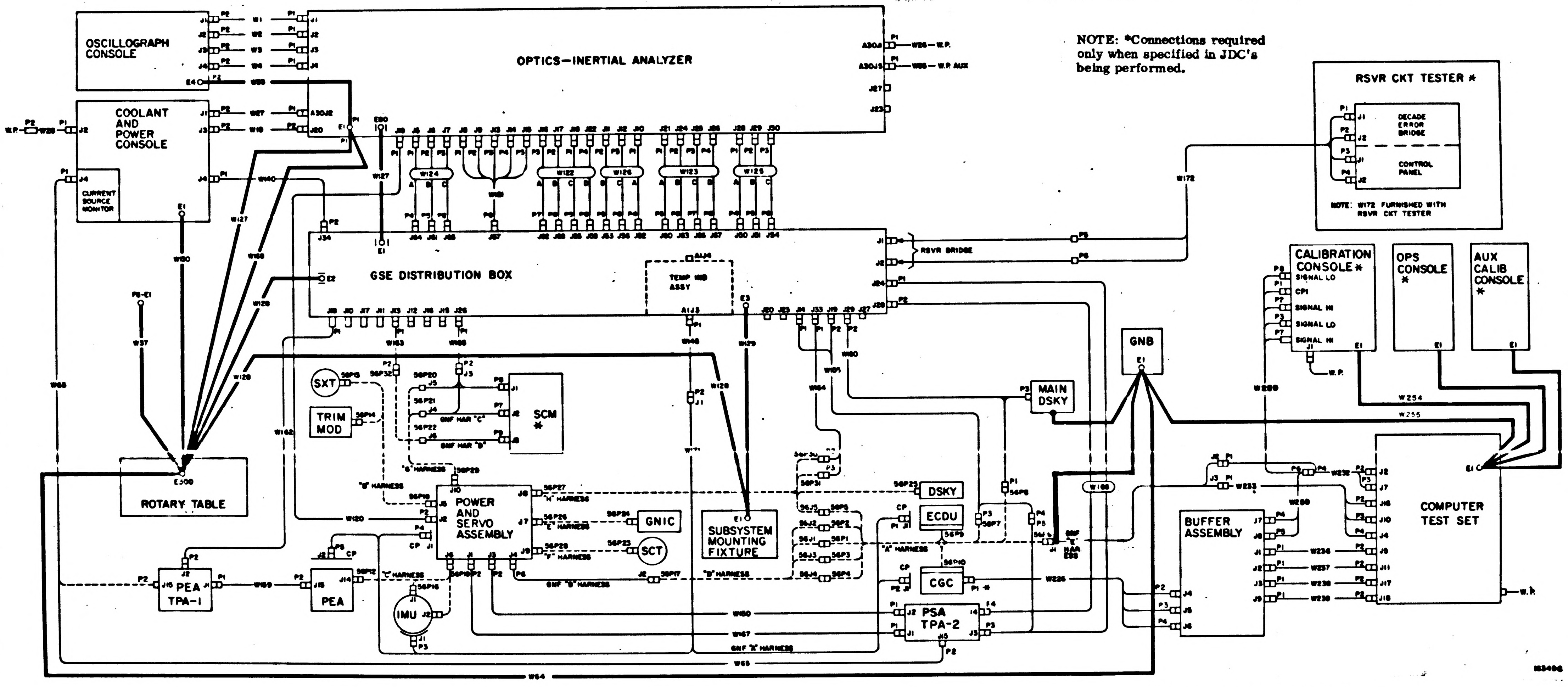
OSCILLOGRAPH CONSOLE
OPTICS—INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
W172
RSVR BRIDGE
GSE DISTRIBUTION BOX
TEMP IND ASSY
CALIBRATION CONSOLE *
SIGNAL LO
CPI
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CONSOLE *
AUX CALIB CONSOLE *
GNB
MAIN DSKY
SXT
TRIM MOD
SCM *
GNF HAR "C"
GNF HAR "B"
ROTARY TABLE
POWER AND SERVO ASSEMBLY
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
PSA TPA-2
PEA TPA-1
PEA
IMU
BUFFER ASSEMBLY
COMPUTER TEST SET
"A" HARNESS
"B" HARNESS
"E" HARNESS
"F" HARNESS
"H" HARNESS
"D" HARNESS
GNF "B" HARNESS
GNF "A" HARNESS
W254
W255
W232
W233
W236
W237
W238
W239
W226
W64
W65
W66
W127
W128
W129
W160
W167
W169
W.P.
W.P. AUX
E300
183496

Figure 1. Block II G&N Configuration

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. G
INITIAL TDRR 29882

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. G

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT: Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.	REJECTED	ACCEPTED
REMARKS:		

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. G

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. G

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				25		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV. H PAGE 1 OF 9

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	9-1-66	30932	3	-	JP	-
B	10-13-66	31507	4 - 8	-	EA	-
C	11-10-66	31884	9	4	EA	-
D	11-17-66	31961	6, 7, 8	-	EA	-
E	7-20-67	34175	3, 9	1, 2	SB	-
F	8-24-67	34431	3, 9	-	EA	-
G	2-2-68	35558	3	-	EA	-
H	10-21-68	36933	1, 3, 9	-	EA	-

REFERENCES PS 2015000

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Wheatstone Bridge or equivalent and Battery Operated Voltohmmeter

NOTE: Use Wheatstone Bridge, or equivalent, for resistance measurements less than 500 ohms.

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV H PAGE 2 OF 9

SUBSYSTEM G & N SYSTEM

ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
l.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 1 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV H PAGE 3 OF 9

SUBSYSTEM G & N SYSTEM

ASSY

Table 1

NOTE: Connection of cable W226 between the buffer assembly and the CGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the CGC test connector, insure that connector assembly (2003099) is installed on the CGC test connector.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19 J14	P2 P1	W155 (2900662)	P3	P7	"A" Harness
	J33	P1	W164 (2900669)	P2 P3	P30 P31	"H" Harness
	J13	P1	W163 (2900668)	P2	P32	"G" Harness
	J29	P2	W160 (2900665)	P1	P8	"A" Harness
	J26	P1	W165 (2900670)			
GNF "E" Harness	J9	P6	"A" Harness			
					E1	G&N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC (See NOTE above)		P1	W226 (2014137-011)	P2 P3 P4	J4 J5 J6	Buffer Assembly

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G&N Mounting Fixture.

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

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SUBSYSTEM G & N SYSTEM

ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021
	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043

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PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV H PAGE 5 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008
	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005

DATE ______

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Chg. 7-23-65

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV H PAGE 6 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18052
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028
	Applying signals to dual beam oscilloscope, scope "B," channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034

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PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV H PAGE 7 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of Chart Speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	Performance verification	19253
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104

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PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV H PAGE 8 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel (cont)	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

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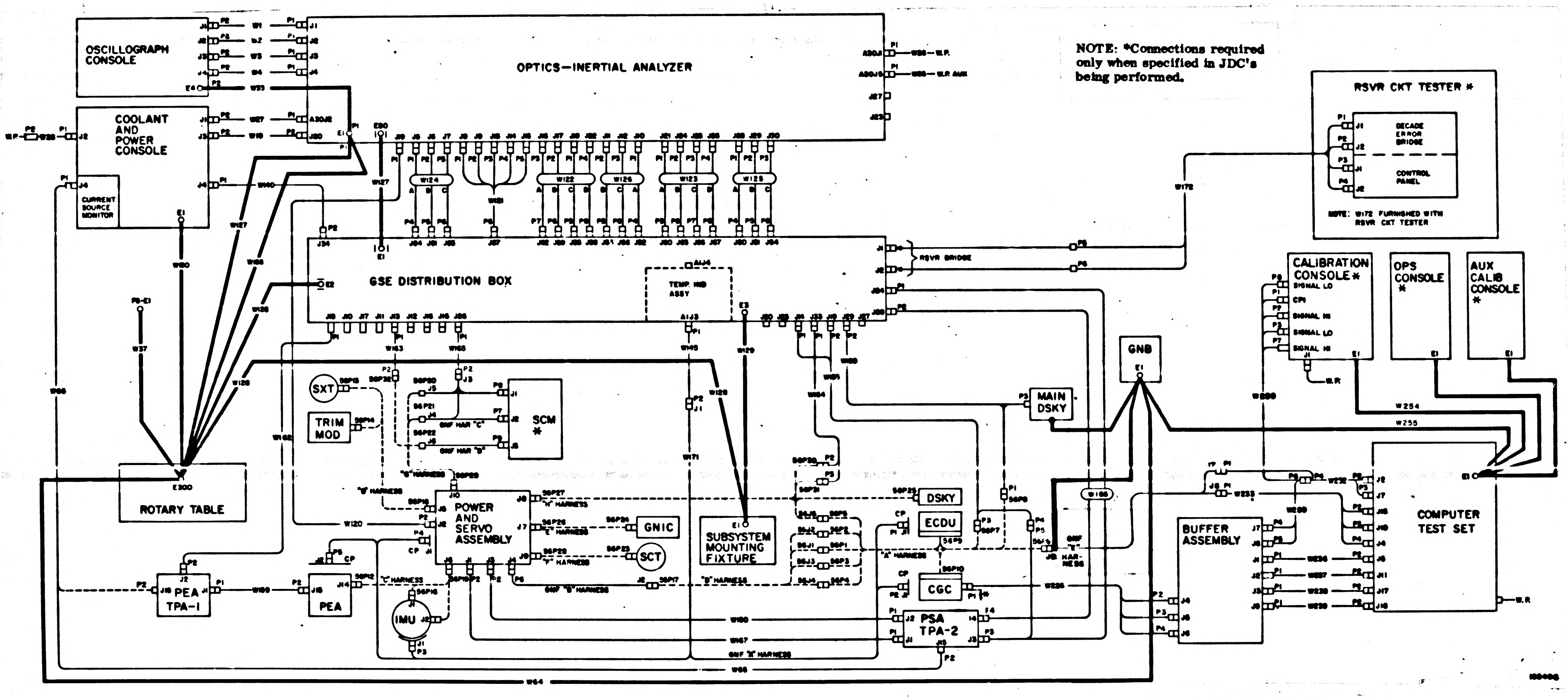
PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV H PAGE 9 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

NOTE: *Connections required only when specified in JDC's being performed.



OSCILLOGRAPH CONSOLE
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
OPTICS—INERTIAL ANALYZER
GSE DISTRIBUTION BOX
TEMP IND ASSY
RSVR BRIDGE
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE *
SIGNAL LO
CPI
SIGNAL HI
OPS CONSOLE *
AUX CALIB CONSOLE *
GNB
MAIN DSKY
COMPUTER TEST SET
BUFFER ASSEMBLY
ROTARY TABLE
E300
SXT
TRIM MOD
SCM *
POWER AND SERVO ASSEMBLY
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
PEA TPA-1
PEA
IMU
PSA TPA-2
W172
W254
W255
W64
W66
W67
W160
W120
W162
W128
W171
W129
W163
W165
"B" HARNESS
"C" HARNESS
"D" HARNESS
"E" HARNESS
"F" HARNESS
"H" HARNESS
GNF HAR "C"
GNF HAR "D"
GNF "B" HARNESS
GNF "A" HARNESS
W.P.
W.P. AUX

Figure 1. Block II G&N Configuration

DATE 19 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. H
INITIAL TDRR 29882

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION   APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. H

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT:	REJECTED	ACCEPTED
Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.		
REMARKS:		

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. H

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. H

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				25		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV. J PAGE 1 OF 9 INITIAL TDRR 29882 D.S. PGS 4
SUBSYSTEM G & N SYSTEM	ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	9-1-66	30932	3	-	JP	-
B	10-13-66	31507	4 - 8	-	EA	-
C	11-10-66	31884	9	4	EA	-
D	11-17-66	31961	6, 7, 8	-	EA	-
E	7-20-67	34175	3, 9	1, 2	SB	-
F	3-24-67	34431	3, 9	-	EA	-
G	2-2-68	35558	3	-	EA	-
H	10-21-68	36933	1, 3, 9	-	EA	-
J	3-11-69	37400	2	-	EA	-

REFERENCES PS 2015000

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Wheatstone Bridge or equivalent and Battery Operated Voltohmmeter

NOTE: Use Wheatstone Bridge, or equivalent, for resistance measurements less than 500 ohms.

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV J PAGE 2 OF 9
SUBSYSTEM G & N SYSTEM	ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
l.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 2 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV J PAGE 3 OF 9
SUBSYSTEM G & N SYSTEM	ASSY

Table 1

NOTE: Connection of cable W226 between the buffer assembly and the CGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the CGC test connector, insure that connector assembly (2003099) is installed on the CGC test connector.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19	P2	W155 (2900662)	P3	P7	"A" Harness
	J14	P1				
	J33	P1	W164 (2900669)	P2 P3	P30 P31	"H" Harness
	J13	P1	W163 (2900668)	P2	P32	"G" Harness
	J29	P2	W160 (2900665)	P1	P8	"A" Harness
	J26	P1	W165 (2900670)			
GNF "E" Harness	J9	P6	"A" Harness			
					E1	G&N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC (See NOTE above)		P1	W226 (2014137-011)	P2	J4	Buffer Assembly
				P3	J5	
				P4	J6	

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G&N Mounting Fixture.

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV J PAGE 4 OF 9
SUBSYSTEM G & N SYSTEM	ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021
	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV J PAGE 5 OF

SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Numbe
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008
	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005

DATE ______

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Chg. 7-23-65

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV J PAGE 6 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18052
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028
	Applying signals to dual beam oscilloscope, scope "B," channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV J PAGE 7 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of Chart Speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	Performance verification	19253
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING | JDC 12202 REV J PAGE 8 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

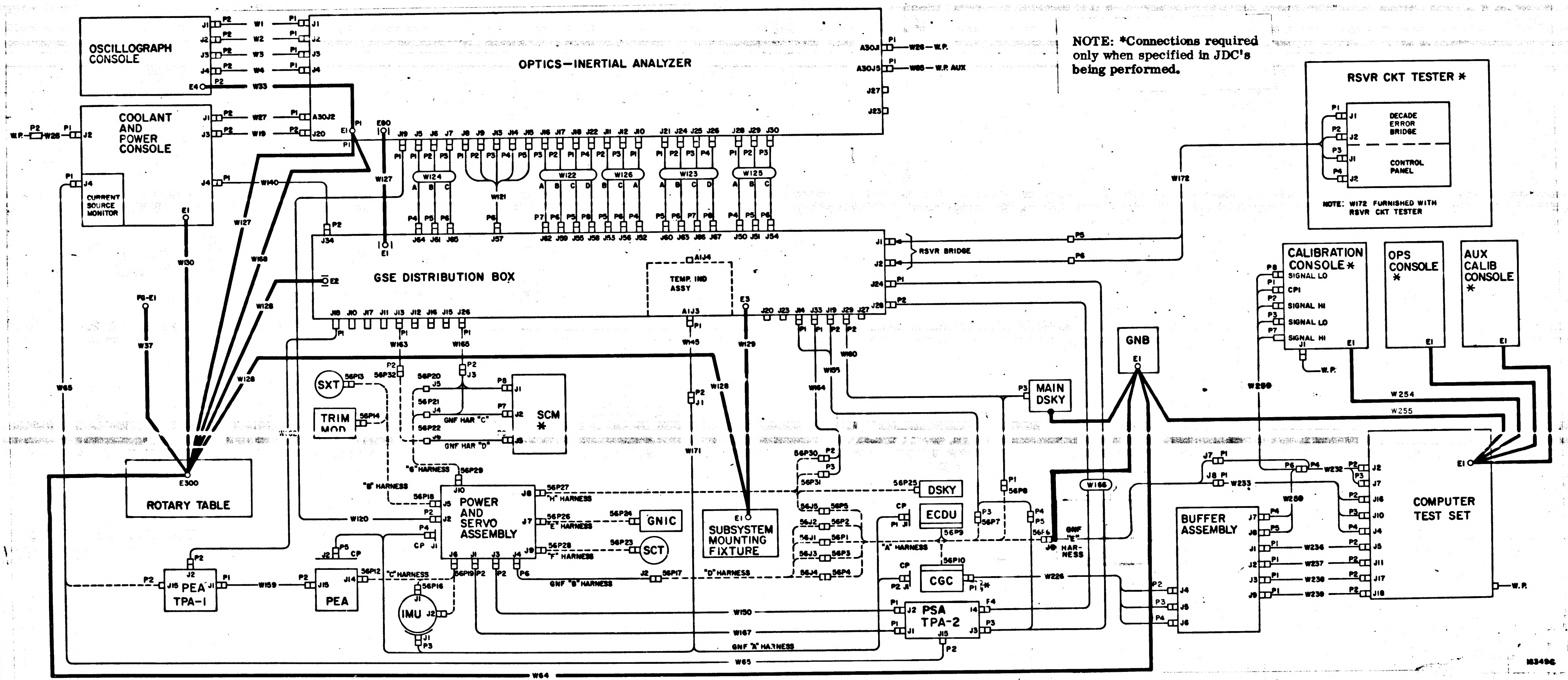
Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel (cont)	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

DATE 30 JUN 66

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV J PAGE 9 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

NOTE: *Connections required only when specified in JDC's being performed.



OSCILLOGRAPH CONSOLE
OPTICS—INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND ASSY
RSVR BRIDGE
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE *
SIGNAL LO
CPI
SIGNAL HI
SIGNAL LO
SIGNAL HI
OPS CONSOLE *
AUX CALIB CONSOLE *
GNB
MAIN DSKY
COMPUTER TEST SET
BUFFER ASSEMBLY
ROTARY TABLE
E300
SXT
TRIM MOD
SCM *
GNF HAR "C"
GNF HAR "D"
"G" HARNESS
"B" HARNESS
POWER AND SERVO ASSEMBLY
"H" HARNESS
"E" HARNESS
"F" HARNESS
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
"A" HARNESS
"D" HARNESS
GNF "B" HARNESS
"C" HARNESS
GNF "E" HARNESS
GNF "A" HARNESS
PEA TPA-1
PEA
IMU
PSA TPA-2
W1
W2
W3
W4
W33
W27
W19
W26
W.P.
W66
W.P. AUX
W140
W127
W168
W128
W130
W37
W65
W124
W121
W122
W126
W123
W125
W163
W165
W145
W129
W171
W164
W155
W160
W172
W166
W120
W159
W150
W167
W64
W226
W254
W255
W250
W232
W233
W236
W237
W238
W239
FG-E1
163496

Figure 1. Block II G&N Configuration

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. J
INITIAL TDRR 29882

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. J

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT:	REJECTED	ACCEPTED
Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.		
REMARKS:		

DATE 30 JUN 66

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. J

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. J

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				25		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 00150
Chg. 7-23-65

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV. K PAGE 1 OF 9
INITIAL TDRR 29882 D.S. PGS 4
SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	9-1-66	30932	3	-	JP	-
B	10-13-66	31507	4 - 8	-	EA	-
C	11-10-66	31884	9	4	EA	-
D	11-17-66	31961	6, 7, 8	-	EA	-
E	7-20-67	34175	3, 9	1, 2	SB	-
F	8-24-67	34431	3, 9	-	EA	-
G	2-2-68	35558	3	-	EA	-
H	10-21-68	36933	1, 3, 9	-	EA	-
J	3-11-69	37400	2	-	EA	-
K	10-10-69	37857	9	-	EA	-

REFERENCES PS 2015000

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Wheatstone Bridge or equivalent and Battery Operated Voltohmmeter

NOTE: Use Wheatstone Bridge, or equivalent, for resistance measurements less than 500 ohms.

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV K PAGE 2 OF 9
SUBSYSTEM G & N SYSTEM
ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO.
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
l.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 2 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

DATE 30 JUN 66

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV K PAGE 3 OF 9
SUBSYSTEM G & N SYSTEM
ASSY

Table 1

NOTE: Connection of cable W226 between the buffer assembly and the CGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the CGC test connector, insure that connector assembly (2003099) is installed on the CGC test connector.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19 J14	P2 P1	W155 (2900662)	P3	P7	"A" Harness
	J33	P1	W164 (2900669)	P2 P3	P30 P31	"H" Harness
	J13	P1	W163 (2900668)	P2	P32	"G" Harness
	J29	P2	W160 (2900665)	P1	P8	"A" Harness
	J26	P1	W165 (2900670)			
GNF "E" Harness	J9	P6	"A" Harness			
					E1	G&N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC (See NOTE above)		P1	W226 (2014137-011)	P2 P3 P4	J4 J5 J6	Buffer Assembly

NOTE: Insure that all GSE cable shielding pigtails are properly connected to the G&N Mounting Fixture.

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JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING
JDC 12202 REV K PAGE 4 OF 9
SUBSYSTEM G & N SYSTEM
ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry.	18021
	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043

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PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING — JDC 12202 REV K PAGE 5 OF 9
SUBSYSTEM G & N SYSTEM — ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008
	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005

DATE

FORM 00145
Chg. 7-23-65

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING — JDC 12202 REV K PAGE 6 OF 9
SUBSYSTEM G & N SYSTEM — ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18052
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028
	Applying signals to dual beam oscilloscope, scope "B," channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034

DATE 30 JUN 66

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING — JDC 12202 REV K PAGE 7 OF 9
SUBSYSTEM G & N SYSTEM — ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of Chart Speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	Performance verification	19253
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104

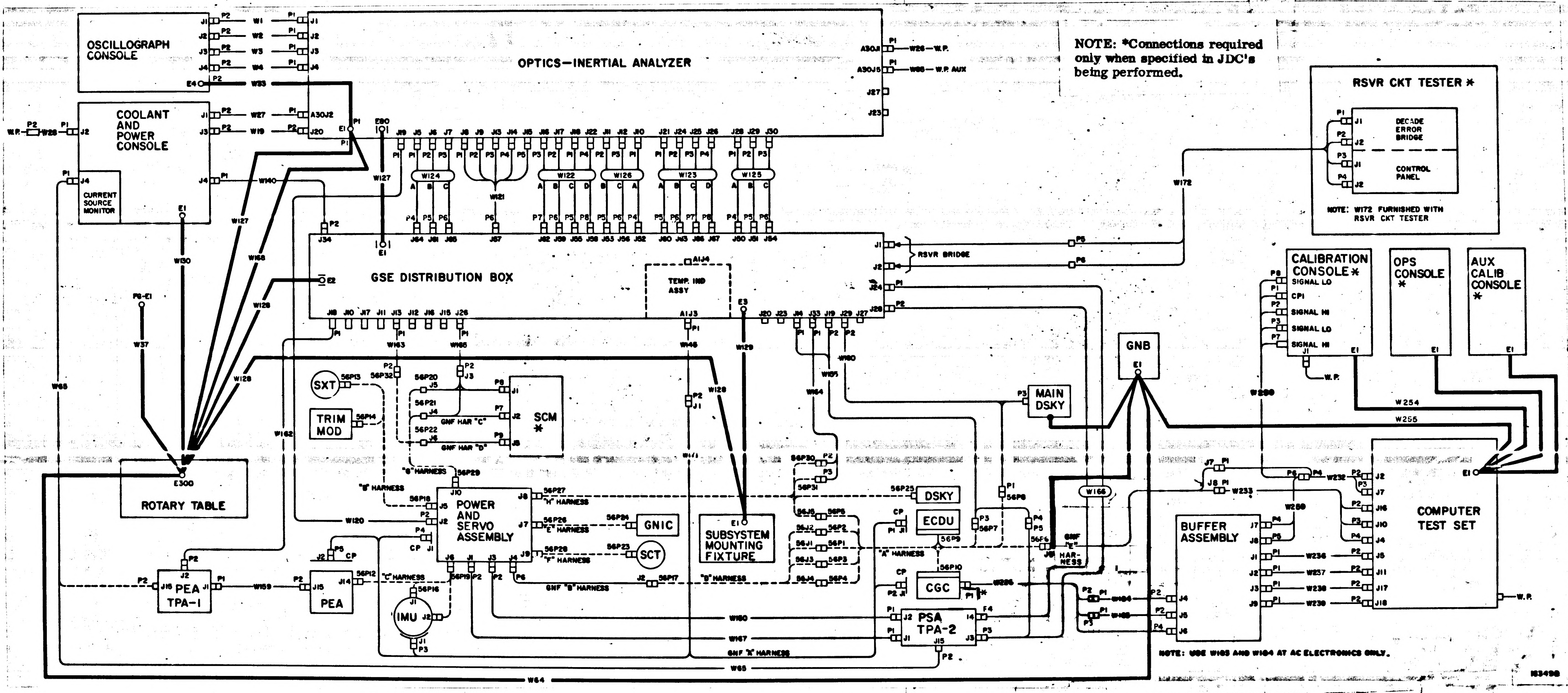
DATE 30 JUN 66

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING — JDC 12202 REV K PAGE 8 OF 9
SUBSYSTEM G & N SYSTEM — ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel (cont)	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

DATE 30 JUN 66


OSCILLOGRAPH CONSOLE
OPTICS—INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND ASSY
RSVR CKT TESTER *
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
RSVR BRIDGE
CALIBRATION CONSOLE *
OPS CONSOLE *
AUX CALIB CONSOLE *
GNB
MAIN DSKY
SXT
TRIM MOD
SCM *
ROTARY TABLE
POWER AND SERVO ASSEMBLY
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
PEA TPA-1
PEA
IMU
PSA TPA-2
BUFFER ASSEMBLY
COMPUTER TEST SET
W.P.
W64
W65
183498

NOTE: *Connections required only when specified in JDC's being performed.

NOTE: USE W165 AND W164 AT AC ELECTRONICS ONLY.

Figure 1. Block II G&N Configuration

DATE 19 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. K
INITIAL TDRR 29882

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. K

JOB PREPARE GSE FOR G&N SYSTEM ACCEPTANCE TESTING

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT:	REJECTED	ACCEPTED
Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.		
REMARKS:		

DATE 30 JUN 66

FORM 001-8
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. K

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 90150
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. K

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				25		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 90150
Chg. 7-23-65

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV. - PAGE 1 OF 6

INITIAL TDRR 29982 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Connect cables and check for continuity and ground isolation. Provide index of GSE operating procedures.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES

IMPORTANT Performance of JDC 12201 required before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL Battery Operated Volt-Ohmmeter or Wheatstone Bridge

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power connectors 56P30 and 56P31 are disconnected from power sources.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV - PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

4. Using a Volt-Ohmmeter, measure resistance between following pins:

	GRD SYSTEM	FROM	GRD SYSTEM	TO
a.	0 VDC IMU OPERATE Bus A	56P30-15	structure grd	56P30-6
b.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC optics Bus A	56P30-14
c.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC CGC Bus A	56P30-1
d.	0 VDC IMU OPERATE Bus A	56P30-15	400 cps 115V LO	56P30-18
e.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus A	56P30-16
f.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU STANDBY Bus A	56P30-3
g.	0 VDC IMU OPERATE Bus A	56P30-15	0 VDC IMU OPERATE Bus B	56P31-15
h.	0 VDC optics Bus A	56P30-14	0 VDC optics Bus B	56P31-14
i.	0 VDC CGC Bus A	56P30-1	0 VDC CGC Bus B	56P31-1
j.	structure grd Bus A	56P30-6	structure grd Bus B	56P31-6
k.	0 VDC IMU OPERATE Bus A	56P30-16	0 VDC IMU OPERATE Bus B	56P31-16
l.	0 VDC IMU STANDBY Bus A	56P30-3	0 VDC IMU STANDBY Bus B	56P31-3
m.	0 VDC Optics Bus A	56P30-14	structure grd Bus A	56P30-6
n.	0 VDC CGC Bus A	56P30-1	0 VDC Optics Bus A	56P30-14
o.	0 VDC CGC Bus A	59P30-1	structure grd Bus A	56P30-6
p.	400 cps 115V Low	56P30-18	structure grd Bus A	56P30-6
q.	400 cps 115V Low	56P30-18	0 VDC Optics Bus A	56P30-14
r.	400 cps 115V Low	56P30-18	0 VDC CGC Bus A	56P30-1

5. Using the Volt-Ohmmeter, measure the resistance between point E2 and Facility Ground as shown in Figure 1 of JDC 12201.

6. Using the Volt-Ohmmeter, measure the resistance between the following pins:

	FROM	TO
a.	56P30-2	56P30-1
b.	56P30-9	56P30-15
c.	56P30-10	56P30-16
d.	56P30-7	56P30-14
e.	56P30-8	56P30-3
f.	56P30-17	56P30-18
g.	56P31-2	56P31-1
h.	56P31-9	56P31-15
i.	56P31-10	56P31-16
j.	56P31-7	56P31-14
k.	56P31-8	56P31-3

7. Insure that the following cables are connected from the GSE to airborne equipment: (See figure 1 for cable connections.)

DATE ________

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV - PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

Table 2

NOTE: The cable interconnection specified to CTS are necessary only when performing JDC's. If these JDC's are not to be performed, it is not necessary to make the appropriate cable interconnection to the CTS.

GSE - G & N Interconnections

From	Conn. No.		Cable and drawing No.	Conn. No.		To
GSE DIST - BOX	J19 J14	P2 P1	W155 (2900662)	P3 P4	P7 P5	G&N Harness W166
	J33	P1	W164 (2900669)	P2 P3	P30 P31	G&N Harness
	J13	P1	W163 (2900668)	P2	P32	G&N Harness
	J29	P2	W160 (2900665)	P1 P3	P8 05A3J1	G&N Harness Main DSKY
	J26	P1	W165 (2900670)	P2	J3	GNF "C" Harness
	A1J3	P1	W145 (2900589)	P2		W17
G&N Harness	P6	J1	GNF "E" Harness (2900666)	J2 J3	P1 P1	W233 W232
					E1	G & N Fixture Base
PSA TPA	J1	P1	W167 (2900672)	P2	J1	PSA
	J2	P1	W150 (2900529)	P2	J3	PSA
PEA TPA	J1	P1	W159 (2900675)	P2	J15	PEA
CGC		P4	W226 (2014137-011)	P1 P2 P3	J4 J5 J6	Buffer Assembly

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC 12202 REV - PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

8. Insure that ALGA and STRT 1, STRT 2 switches on AGC Buffer Assembly are on the ON position and that the CONDITION LAMPS switch on the G & N Indicator Control Panel is in the ON position.

9. The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

JDC NO.	JOB
18000	Applying Inertial Signals via the Primary Signal Selector Panel
18001	Applying Reference Signals to the Dual Beam Oscilloscope via the Primary Signal Selector Panel
18202	Applying PSA Test Point Adapter Test Point Signals to the Digital Voltmeter, Phase Angle Voltmeter, and Duel Beam Oscilloscope
18003	Applying Auxiliary Signals via the Primary Signal Selector Panel
18204	Applying Auxiliary Coaxial Signals via the Coaxial Distribution Panel
18005	Voltage Measurement - Dual Beam Oscilloscope
18006	Phase Shift Measurements - Dual Beam Oscilloscope
18007	Time Measurements - Dual Beam Oscilloscope
18008	Frequency Measurements - Dual Beam Oscilloscope
18009	Lower Beam (B Scope, Channel 1) Pulse Monitoring - Dual Beam Oscilloscope
18010	Lower Beam (B Scope) Channel 1 and 2 Monitoring - Dual Beam Oscilloscope
18011	Applying Oscillograph Signals to the Dual Beam Oscilloscope
18012	DC Balance Calibration of Signal Generator
18013	Operation of the Signal Generator
18216	Voltage Measurement with the Current Source Monitor and Galvanometer Voltmeter or JDC 00160, Pulse Torque Electronics Tests
18017	Count Function - Counter
18018	E/UT XN_1 Function - Counter
18019	Ratio Function - Counter
18020	Period Function - Counter
18021	Test N_1 Function - Counter
18022	Test N_2 Function - Counter
18023	Operation of Oscillograph Console (Electric)
18024	Operation of Oscillograph Console (Ink)

DATE ________

JOB	PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING	JDC 12202 REV -	PAGE 5 OF 6
SUBSYSTEM	G & N SYSTEM	ASSY	

JDC NO.	JOB
18025	Calibration of DC Amplifier - Oscillograph
18026	Operation of DC Amplifiers - Oscillograph
18027	Normal Calibration (800 CPS Reference) of the Phase Sensitive Demodulator - Oscillograph
18028	Normal Calibration (3200 CPS Reference) of the Phase Sensitive Demodulator - Oscillograph
18029	Periodic Phase Shift Check and Calibration (800 CPS Reference) of the Phase Sensitive Demodulator-Oscillograph
18031	Operation of the Phase Sensitive Demodulator-Oscillograph
18032	Ink Cartridge Installation - Oscillograph
18033	Pen Installation - Oscillograph
18034	Change Paper - Oscillograph
18035	DC Voltage Measurement - Digital Voltmeter
18036	AC Voltage Measurement - Digital Voltmeter
18037	Automatic Measurement of an AC or DC Voltage - Digital Voltmeter
18038	Measurement of a Total RMS Voltage - Phase Angle Voltmeter
18039	Measurement of a Fundamental RMS Component - Phase Angle Voltmeter
18040	Measurement of a Phase Angle - Phase Angle Voltmeter
18041	Measurement of In-Phase and Quadrature Components - Phase Angle Voltmeter
18042	Indication of a Phase Sensitive Null - Phase Angle Voltmeter
18043	Operation of the Digital Recorder
18244	Gimbal Position Control Panel Operation and Calibration (Inertial Subsystem Test Only)
18045	Operation of Purging and Filling Fixture
18046	C & N Coolant and Power Console Operation and Interconnections
18049	Maintain and Monitor IMU Heat Using ICTC
18050	Auxiliary Input Panel Use and Operation
18103	Applying Auxiliary Signals via the Primary Signal Selector Panel
18104	Applying Signals to the Dual Beam Oscilloscope via the Auxiliary Input Panel
18249	Maintain and Monitor IMU Using Portable Temperature Controller
18260	Performance Verification of the Digital Voltmeter
18261	Performance Verification of the Phase Angle Voltmeter

DATE ____________

PREPARE GSE FOR G & N SYSTEM
JOB ACCEPTANCE TESTING | JDC 12202 REV - PAGE 6 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

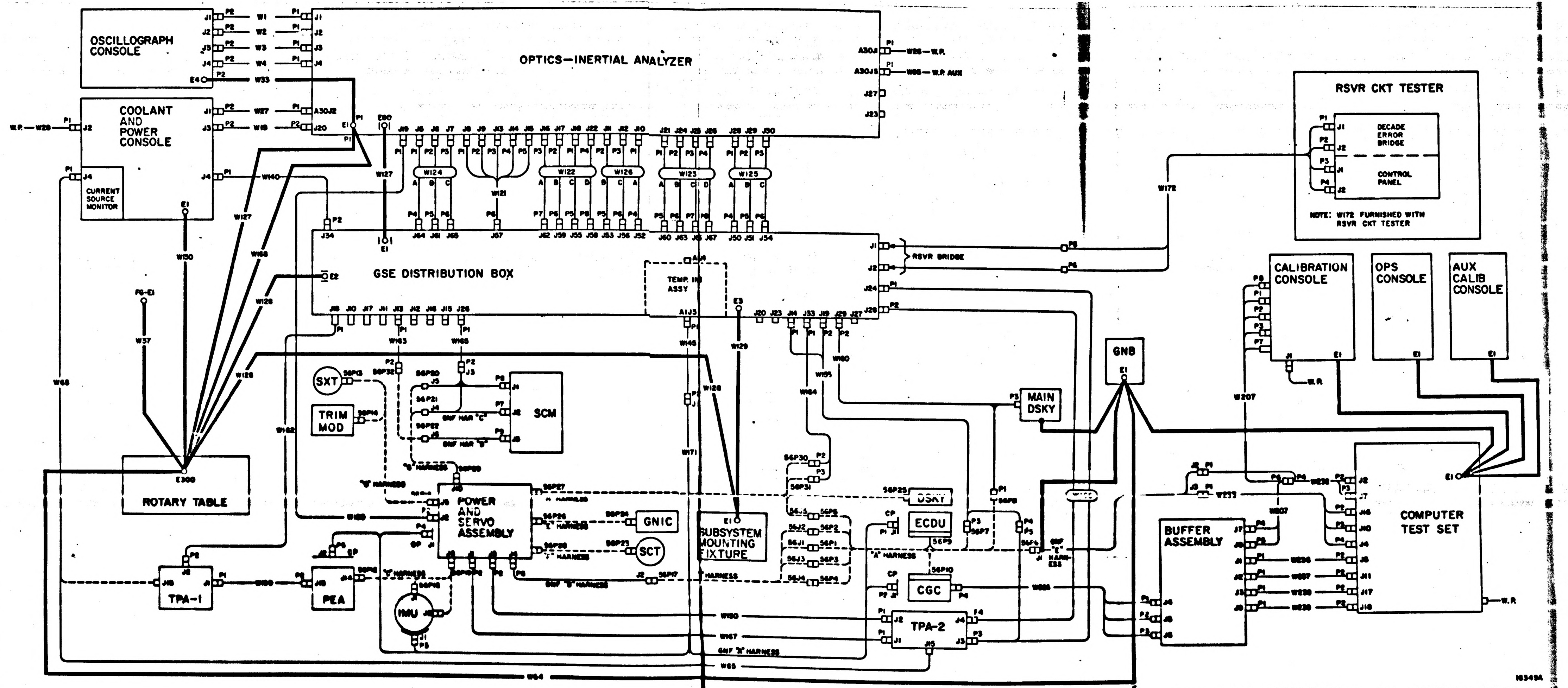

OSCILLOSCOPE CONSOLE
OPTICS—INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
TEMP. IND ASSY
RSVR BRIDGE
RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
NOTE: W172 FURNISHED WITH RSVR CKT TESTER
CALIBRATION CONSOLE
OPS CONSOLE
AUX CALIB CONSOLE
GNB
MAIN DSKY
SXT
TRIM MOD
SCM
POWER AND SERVO ASSEMBLY
GNIC
SCT
SUBSYSTEM MOUNTING FIXTURE
DSKY
ECDU
CGC
ROTARY TABLE
TPA-1
PEA
IMU
TPA-2
BUFFER ASSEMBLY
COMPUTER TEST SET
W24
W121
W122
W126
W123
W125
W127
W128
W129
W130
W140
W162
W163
W165
W167
W168
W171
W172
W207
W64
W65
W37
"A" HARNESS
"B" HARNESS
GNF "A" HARNESS
GNF "B" HARNESS
GNF HAR "C"
GNF HAR "D"
W.R.
W.R AUX
16349A

Figure 1. Cable Connections

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12202
REV. -
INITIAL TDRR 2882

JOB

ASSEMBLY UNDER TEST

TITLE
SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NUMBER 1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing.)	Tester's Initials

DATE

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12202
REV. -

JOB

JDC ITEM NUMBER 2 CALIBRATION OF TEST EQUIPMENT: Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.	REJECTED	ACCEPTED
REMARKS:		

DATE

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12202
REV. -

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
4.a	Resistance	ohms	1000.0				infinity		
4.b	Resistance	ohms	1000.0				infinity		
4.c	Resistance	ohms	1000.0				infinity		
4.d	Resistance	mego	5.0				infinity		
4.e	Resistance	ohm	0				0.5		
4.f	Resistance	ohm	0				0.5		
4.g	Resistance	ohm	0				0.5		
4.h	Resistance	ohm	0				0.5		
4.i	Resistance	ohm	0				0.5		
4.j	Resistance	ohm	0				0.5		
4.k	Resistance	ohm	0				0.5		
4.l	Resistance	ohm	0				0.5		
4.m	Resistance	ohms	1000.0				▨		
4.n	Resistance	ohms	1000.0				▨		
4.o	Resistance	ohms	0.0				2.0		
4.p	Resistance	mego	5.0				▨		
4.q	Resistance	mego	5.0				▨		
4.r	Resistance	mego	5.0				▨		
5	Resistance	ohms	0				0.5		
6.a	Resistance	ohms	2.8				▨		
6.b	Resistance	ohms	1.1				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12202
REV. -

JOB PREPARE GSE FOR G & N SYSTEM ACCEPTANCE TESTING

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6.c	Resistance	ohms	1.1				▨		
6.d	Resistance	ohms	2.8				▨		
6.e	Resistance	ohms	3.7				▨		
6.f	Resistance	ohms	5				▨		
6.g	Resistance	ohms	2.8				▨		
6.h	Resistance	ohms	1.1				▨		
6.i	Resistance	ohms	1.1				▨		
6.j	Resistance	ohms	2.8				▨		
6.k	Resistance	ohms	3.7				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE

JOB GROUND SUPPORT EQUIPMENT TURN ON
JDC 12203 REV. A PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 2
SUBSYSTEM G & N SYSTEM
ASSY.
DESCRIPTION Prepare ground support equipment for G & N system test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	12-15-66	32343	2.3	-	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Press the OIA ON/ISS POWER DISABLED pushbutton on the Test Control Panel.

2. Insure that the BLOCK II and G/N TEST CONFIG pushbuttons on the Monitor panel are lighted.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during steps 3 and 4. The COOLANT SUPPLY FAIL indicator on the Monitor Panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton on Monitor Panel to inhibit the alarm.

3. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.

4. Set the COOLANT PUMP switches on the rear of the G & N Coolant and Power Console as listed in Table 1.

5. Determine FLOW indicator readings (centimeters) as a function of SUPPLY TEMP from the coolant supply CALIBRATION CHART to obtain flow rates listed in Table 1.

6. Adjust the TEMP CONT to obtain temperatures listed in Table 1 and as indicated on the SUPPLY TEMP meter on the Coolant Supply panel.

7. Allow 15 minutes for initial cooling then readjust the FLOW CONT and TEMP [illegible] to null the temperature [illegible] GSE Distribution

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM 00143
Chg. 7-23-65

JOB GROUND SUPPORT EQUIPMENT TURN ON
JDC 12203 REV A PAGE 2 OF 3
SUBSYSTEM G & N SYSTEM
ASSY

Circuit No.	Inlet Temperature	Flow Rate	Pump Switch
1. IMU	40 (±3) °F	33 (±3) lbs/hr	ON
2. Jumpered			OFF
3. PSA	60 (±5) °F	120 (±10) lbs/hr	ON
4. CDU	60 (±5) °F	180 (±10) lbs/hr	ON

Table 1

NOTE: The IMU nulls at 45° F on the GSE Distribution Box meter. The PEA, PSA and CDU coldplates null at 72° F and the CGC coldplate nulls at 85° F. If the coldplate sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

7. Allow 15 minutes for initial cooling then readjust the FLOW CONT and TEMP CONT as necessary to null the temperature sensor indicators on the GSE Distribution Box to within +0, -5° F of the null point for the PSA and CDU and within ±3° F of the null point for the IMU. Record the temperature deviations from null of all components including the CGC and PEA.

8. Allow 30 minutes for GSE to warm up and the coolant temperature to stabilize.

9. Measure and record the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated.

SIGNAL	CROSSBAR CONTROL
a. 115V, 60 cps GSE ØA	279
b. 115V, 60 cps GSE ØB	180
c. 115V, 60 cps GSE ØC	280
d. 27 VDC GSE Relay Power	179
e. 28 VDC G & N	171
f. +30 VDC GSE Power	170
g. -30 VDC Power 270	270
h. 115V, 400 cps A/B	177

10. Record the null deviations of all components at the end of the 30 minute stabilizing time. Record Circuit No. 1 flow.

11. Set switches on Computer Test Set as follows:

SWITCH	POSITION
a. Power Control panel -	
All switches	OFF
Range Select	1000V
ACVM range switch	500V
b. AC Input panel -	
STA POWER	OFF
c. Tape Perforator panel -	
ON/OFF	OFF
d. Logic Drawer No. 1 -	
All switches	Fully CCW
e. Logic Drawer No. 2 -	
All switches	OFF

DATE 30 JUN 66

JOB GROUND SUPPORT EQUIPMENT TURN ON
JDC 12203 REV A PAGE 3 OF 3
SUBSYSTEM G & N SYSTEM
ASSY

SWITCH	POSITION
f. Programmer and Monitor panel -	
REGISTER SELECT	OFF
TEST MODE	SYSTEM
MODE CONTROL	Any position
ALARM RESET	Press to turn off alarms
g. Power Supply panel -	
All switches	ON
h. Frequency Counter panel -	
FUNCTION	TIME A→B
FREQ-TIME	SEC
POWER	ON
GATE	AUTO
INPUT VOLTS RMS	Any position
TRIGGER LEVEL	Any position
i. Power Control panel -	
VOLTAGE SELECT	ACG - OFF
RANGE SELECT	1000V
AGC VOLTAGE switches	OFF
TEST SET	ON
STATION	ON
ACVM	ON
j. Oscilloscope panel -	
SCALE ILLUM	Any position but OFF
k. XY Interface panel -	
SCOPE	OFF
FREQ+PHASE	OFF
OUT→IN	OFF
Y MARGINS	NORM

SWITCH	POSITION
l. RDC Interface panel -	
CHAN V METERS	OFF
DE MARGINS	NORM
All other switches	Fully CCW
m. Tape Recorder panel -	
ON/OFF	OFF
n. Self Test panel -	
None	
o. Power Supply 3VDC panel -	
All switches	ON
INDICATOR SELECTOR	VOLTAGE REGULATED
p. AC Input panel (back of console) -	
STA POWER	ON
AUX OUTLETS	OFF
q. XY Interface panel -	
DL ENABLE	Press to light
WORD RATE 50 PPS	Press to light
r. Programmer and Monitor panel -	
MONITOR	Press to light

If VERIFY FAIL lamp is lighted, press VERIFY FAIL RESET pushbutton so that VERIFY FAIL lamp goes out.

SWITCH	POSITION
ALARM RESET	Press to turn off alarms.

DATE 30 JUN 66

FORM 00144
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12203
REV. A
INITIAL TDRR 29882

JOB GROUND SUPPORT EQUIPMENT TURN ON

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
7	IMU Temp Deviation	°F	▨				▨		
	PSA Temp Deviation	°F	▨				▨		
	CDU Temp Deviation	°F	▨				▨		
	PEA Temp Deviation	°F	▨				▨		
	CGC Temp Deviation	°F	▨				▨		
10	IMU Temp Deviation	°F	-3				+3		
	PSA Temp Deviation	°F	-5				0		
	CDU Temp Deviation	°F	-5				0		
	PEA Temp Deviation	°F	▨				▨		
	CGC Temp Deviation	°F.	▨				▨		
	Circuit No.1 Flow	CM	▨				▨		
9.a	115V, 60 cps ØA	VAC	105				125		
9.b	115V, 60 cps ØB	VAC	105				125		
9.c	115V, 60 cps ØC	VAC	105				125		
9.d	27 VDC	VDC	25				29		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 00149
Chg. 7-23-65

JOB GROUND SUPPORT EQUIPMENT TURN ON | JDC 12203 REV. A PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Prepare ground support equipment for G & N system test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	12-15-66	32343	2.3	-	EA	-	
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

1. Press the OIA ON/ISS POWER DISABLED pushbutton on the Test Control Panel.

2. Insure that the BLOCK II and G/N TEST CONFIG pushbuttons on the Monitor panel are lighted.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during steps 3 and 4. The COOLANT SUPPLY FAIL indicator on the Monitor Panel may flash and the alarm bell may ring. Press the PUSH-TO INHIB ALARM pushbutton on Monitor Panel to inhibit the alarm.

3. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.

4. Set the COOLANT PUMP switches on the rear of the G & N Coolant and Power Console as listed in Table 1.

5. Determine FLOW indicator readings (centimeters) as a function of SUPPLY TEMP from the coolant supply CALIBRATION CHART to obtain flow rates listed in Table 1.

6. Adjust the TEMP CONT to obtain temperatures listed in Table 1 and as indicated on the SUPPLY TEMP meter on the Coolant Supply panel.

7. Allow 15 minutes for initial cooling then readjust the FLOW CONT and TEMP CONT as necessary to null the temperature sensor indicators on the GSE Distribut

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB GROUND SUPPORT EQUIPMENT TURN ON | JDC 12203 REV A PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

Circuit No.	Inlet Temperature	Flow Rate	Pump Switch
1. IMU	40 (±3) °F	33 (±3) lbs/hr	ON
2. Jumpered			OFF
3. PSA	60 (±5) °F	120 (±10) lbs/hr	ON
4. CDU	60 (±5) °F	180 (±10) lbs/hr	ON

Table 1

NOTE: The IMU nulls at 45° F on the GSE Distribution Box meter. The PEA, PSA and CDU coldplates null at 72° F and the CGC coldplate nulls at 85° F. If the coldplate sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

7. Allow 15 minutes for initial cooling then readjust the FLOW CONT and TEMP CONT as necessary to null the temperature sensor indicators on the GSE Distribution Box to within +0, -5° F of the null point for the PSA and CDU and within ±3° F of the null point for the IMU. Record the temperature deviations from null of all components including the CGC and PEA.

8. Allow 30 minutes for GSE to warm up and the coolant temperature to stabilize.

9. Measure and record the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated.

SIGNAL	CROSSBAR CONTROL
a. 115V, 60 cps GSE ØA	279
b. 115V, 60 cps GSE ØB	180
c. 115V, 60 cps GSE ØC	280
d. 27 VDC GSE Relay Power	179
e. 28 VDC G & N	171
f. +30 VDC GSE Power	170
g. -30 VDC Power 270	270
h. 115V, 400 cps A/B	177

10. Record the null deviations of all components at the end of the 30 minute stabilizing time. Record Circuit No. 1 flow.

11. Set switches on Computer Test Set as follows:

SWITCH	POSITION
a. Power Control panel -	
All switches	OFF
Range Select	1000V
ACVM range switch	500V
b. AC Input panel -	
STA POWER	OFF
c. Tape Perforator panel -	
ON/OFF	OFF
d. Logic Drawer No. 1 -	
All switches	Fully CCW
e. Logic Drawer No. 2 -	
All switches	OFF

DATE 30 JUN 66

JOB GROUND SUPPORT EQUIPMENT TURN ON | JDC 12203 REV A PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

SWITCH	POSITION
f. Programmer and Monitor panel -	
REGISTER SELECT	OFF
TEST MODE	SYSTEM
MODE CONTROL	Any position
ALARM RESET	Press to turn off alarms
g. Power Supply panel -	
All switches	ON
h. Frequency Counter panel -	
FUNCTION	TIME A→B
FREQ-TIME	SEC
POWER	ON
GATE	AUTO
INPUT VOLTS RMS	Any position
TRIGGER LEVEL	Any position
i. Power Control panel -	
VOLTAGE SELECT	ACG - OFF
RANGE SELECT	1000V
AGC VOLTAGE switches	OFF
TEST SET	ON
STATION	ON
ACVM	ON
j. Oscilloscope panel -	
SCALE ILLUM	Any position but OFF
k. XY Interface panel -	
SCOPE	OFF
FREQ+ PHASE	OFF
OUT→IN	OFF
Y MARGINS	NORM

SWITCH	POSITION
l. RDC Interface panel -	
CHAN V METERS	OFF
DE MARGINS	NORM
All other switches	Fully CCW
m. Tape Recorder panel -	
ON/OFF	OFF
n. Self Test panel -	
None	
o. Power Supply 3VDC panel -	
All switches	ON
INDICATOR SELECTOR	VOLTAGE REGULATED
p. AC Input panel (back of console) -	
STA POWER	ON
AUX OUTLETS	OFF
q. XY Interface panel -	
DL ENABLE	Press to light
WORD RATE 50 PPS	Press to light
r. Programmer and Monitor panel -	
MONITOR	Press to light

If VERIFY FAIL lamp is lighted, press VERIFY FAIL RESET pushbutton so that VERIFY FAIL lamp goes out.

ALARM RESET	Press to turn off alarms.

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EQUIPMENT TEST
DATA SHEET 1 OF 2

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JOB GROUND SUPPORT EQUIPMENT TURN ON

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
7	IMU Temp Deviation	°F	▨				▨		
	PSA Temp Deviation	°F	▨				▨		
	CDU Temp Deviation	°F	▨				▨		
	PEA Temp Deviation	°F	▨				▨		
	CGC Temp Deviation	°F	▨				▨		
10	IMU Temp Deviation	°F	-3				+3		
	PSA Temp Deviation	°F	-5				0		
	CDU Temp Deviation	°F	-5				0		
	PEA Temp Deviation	°F	▨				▨		
	CGC Temp Deviation	°F	▨				▨		
	Circuit No.1 Flow	CM	▨				▨		
9.a	115V, 60 cps ØA	VAC	105				125		
9.b	115V, 60 cps ØB	VAC	105				125		
9.c	115V, 60 cps ØC	VAC	105				125		
9.d	27 VDC	VDC	25				29		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 **OF** 2

JDC
NO. 12203
REV. A

JOB GROUND SUPPORT EQUIPMENT TURN ON

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
9.e	28 VDC	VDC	26				31		
9.f	+30 VDC GSE	VDC	28				32		
9.g	-30 VDC GSE	VDC	-28				-32		
9.h	115V, 400 cps	VAC	103				126		

*** TO BE USED AS REQUIRED OR DESIRED**

DATE 30 JUN 66

FORM 00150
Chg. 7 23-65

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EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12203
REV. A

JOB GROUND SUPPORT EQUIPMENT TURN ON

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
9.e	28 VDC	VDC	26				31		
9.f	+30 VDC GSE	VDC	28				32		
9.g	-30 VDC GSE	VDC	-28				-32		
9.h	115V, 400 cps	VAC	103				126		

*** TO BE USED AS REQUIRED OR DESIRED**

DATE 30 JUN 66

FORM 00150
Chg. 7-23-65

JOB GROUND SUPPORT EQUIPMENT TURN ON

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INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Prepare ground support equipment for G & N system test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Press the OIA ON/ISS POWER DISABLED pushbutton on the Test Control Panel.

2. Insure that the BLOCK II and G/N TEST CONFIG pushbuttons on the Monitor panel are lighted.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during steps 3 and 4. The COOLANT SUPPLY FAIL indicator on the Monitor Panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton on Monitor Panel to inhibit the alarm.

3. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.

4. Set the COOLANT PUMP switches on the rear of the G & N Coolant and Power Console as listed in Table 1.

5. Determine FLOW indicator readings (centimeters) as a function of SUPPLY TEMP from the coolant supply CALIBRATION CHART to obtain flow rates listed in Table 1.

6. Adjust the TEMP CONT to obtain temperatures listed in Table 1 and as indicated on the SUPPLY TEMP meter on the Coolant Supply panel.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

GROUND SUPPORT EQUIPMENT
JOB TURN ON

JDC 12203 REV - PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

Circuit No.	Inlet Temperature	Flow Rate	Pump Switch
1. IMU	40 (±3)° F	33 (±3) lbs/hr	ON
2. Jumpered			OFF
3. PSA	60 (±5)° F	120 (±10) lbs/hr	ON
4. CDU	60 (±5)° F	180 (±10) lbs/hr	ON

Table 1

NOTE: The IMU nulls at 45° F on the GSE Distribution Box meter. The PEA, PSA and CDU coldplates null at 72° F and the CGC coldplate nulls at 85° F. If the coldplate sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

7. Allow 15 minutes for initial cooling then readjust the FLOW CONT and TEMP CONT as necessary to null the temperature sensor indicators on the GSE Distribution Box to within +0, -5° F of the null point for the PSA and CDU and within ±3° F of the null point for the IMU. Record the temperature deviations from null of all components including the CGC and PEA.

8. Allow 30 minutes for GSE to warm up and the coolant temperature to stabilize.

9. Measure and record the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated.

SIGNAL	CROSSBAR CONTROL
a. 115V, 60 cps GSE ϕA	279
b. 115V, 60 cps GSE ϕB	180
c. 115V, 60 cps GSE ϕC	280
d. 27 VDC GSE Relay Power	179
e. 28 VDC G & N	171
f. +30 VDC GSE Power	170
g. -30 VDC Power 270	270
h. 115V, 400 cps A/B	177

10. Record the null deviations of all components at the end of the 30 minute stabilizing time. Record Circuit No. 1 flow.

11. Set switches on Computer Test Set as follows:

SWITCH	POSITION
a. Power Control panel -	
All switches	OFF
Range Select	1000V
b. AC Input panel -	
STA POWER	OFF
c. Tape Perforator panel -	
ON/OFF	OFF
d. Logic Drawer No. 1 -	
All switches	Fully CCW
e. Logic Drawer No. 2 -	
All switches	OFF

DATE ______

GROUND SUPPORT EQUIPMENT
JOB TURN ON

JDC 12203 REV - PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

SWITCH	POSITION
f. Programmer and Monitor panel -	
REGISTER SELECT	OFF
TEST MODE	SYSTEM
MODE CONTROL	Any position
g. Power Supply panel -	
All switches	ON
h. Frequency Counter panel -	
FUNCTION	TIME A→B
FREQ-TIME	SEC
POWER	ON
GATE	AUTO
INPUT VOLTS RMS	Any position
i. Power Control panel -	
VOLTAGE SELECT	ACG - OFF
RANGE SELECT	1000V
AGC VOLTAGE switches	OFF
TEST SET	ON
STATION	ON
ACVM	ON
j. Oscilloscope panel -	
SCALE ILLUM	Any position but OFF
k. XY Interface panel -	
SCOPE	OFF
FREQ+PHASE	OFF
OUT→IN	OFF
Y MARGINS	NORM

SWITCH	POSITION
l. RDC Interface panel -	
CHAN V METERS	OFF
DE MARGINS	NORM
All other switches	Fully CCW
m. Tape Recorder panel -	
ON/OFF	OFF
n. Self Test panel -	
None	
o. Power Supply 3VDC panel -	
All switches	ON
p. AC Input panel (back of console) -	
STA POWER	ON
AUX OUTLETS	OFF

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

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JOB GROUND SUPPORT EQUIPMENT TURN ON

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
7	IMU Temp Deviation	°F	▨				▨		
	PSA Temp Deviation	°F	▨				▨		
	CDU Temp Deviation	°F	▨				▨		
	PEA Temp Deviation	°F	▨				▨		
	CGC Temp Deviation	°F	▨				▨		
10	IMU Temp Deviation	°F	-3				+3		
	PSA Temp Deviation	°F	-5				0		
	CDU Temp Deviation	°F	-5				0		
	PEA Temp Deviation	°F	▨				▨		
	CGC Temp Deviation	°F	▨				▨		
	Circuit No.1 Flow	CM	▨				▨		
9.a	115V, 60 cps ϕA	VAC	105				125		
9.b	115V, 60 cps ϕB	VAC	105				125		
9.c	115V, 60 cps ϕC	VAC	105				125		
9.d	27 VDC	VDC	25				29		

* TO BE USED AS REQUIRED OR DESIRED

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
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REV. -

JOB GROUND SUPPORT EQUIPMENT TURN ON

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
9.e	28 VDC	VDC	26				31		
9.f	+30 VDC GSE	VDC	28				32		
9.g	-30 VDC GSE	VDC	-28				-32		
9.h	115V, 400 cps	VAC	103				126		

* TO BE USED AS REQUIRED OR DESIRED

DATE ______

FORM 06150
Chg. 7-21-65

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV. A PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

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			JDC	D.S.	MIT	NASA
A	10-20-66	31608	3	1	EA	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: If the System has been OFF (not Standby and AGC power) for 2 or more hours, allow 2 hours before proceeding to step A.5. If the G & N System has been OFF for less than 2 hours, allow an equal time period before proceeding to step A.5.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV A PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

5. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

6. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

7. 90 seconds after performing step A.6 press the OPTICS POWER ON pushbutton. The pushbutton shall light.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 40	NOUN 20	ENTR
c.	VERB 41	NOUN 20	ENTR
d.	+00000		ENTR
e.	+00000		ENTR
f.	+09000		ENTR
g.	Wait 60 seconds		

3. Press the OPTICS POWER ON pushbutton on the Test Control panel. The pushbutton shall go out.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

5. Press the OIA ON/ISS POWER DISABLED pushbutton.

6. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

7. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shut down of the test station is desired, proceed to step B.8.

8. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

9. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV A PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01	NOUN 10	ENTR
00003		ENTR

Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:

VERB 21	NOUN 01	ENTR
01300		ENTR
Row 1 indication from step 10		ENTR

12. Perform the following DSKY operations:

VERB 06	NOUN 02	ENTR
01300		ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

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REV. A
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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE

SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication =	a
	Time of day =	b
12	Row 1 indication =	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ______ hours	d
	Time to overflow = 23.3 - line d = ______ hours	e
	Time of overflow = line b + line e = ______	

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV. B PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A.5. with the following exceptions:

a. If the G & N system has been in the power off state for less than five days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90° with IMU mounting fixture set at 32.5°) and the system has not been moved, allow

VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV B PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

90 seconds to elapse before proceeding.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

6. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

7. 90 seconds after performing step A.6 press the OPTICS POWER ON pushbutton. The pushbutton shall light.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV B PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +09000 ENTR
g. Wait 60 seconds

3. Press the OPTICS POWER ON pushbutton on the Test Control panel. The pushbutton shall go out.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

5. Press the OIA ON/ISS POWER DISABLED pushbutton.

6. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

7. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shut down of the test station is desired, proceed to step B.8.

8. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

9. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12204
REV. B
INITIAL TDRR

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE
SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication =	a
	Time of day =	b
12	Row 1 indication =	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ______ hours	d
	Time to overflow = 23.3 - line d = ______ hours	e
	Time of overflow = line b + line e = ______	

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV. C PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-
C	11-10-66	31886	2,3	-	EA	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A.5. with the following exceptions:

a. If the G & N system has been in the power off state for less than five days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90° with IMU mounting fixture set at 32.5°) and the system has not been moved, allow

VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV C PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

90 seconds to elapse before proceeding.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

6. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

7. Deleted.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV C PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR
Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +09000 ENTR
g. Wait 60 seconds

3. Insure that OPTICS POWER ON pushbutton is not lighted. If it is lighted, press OPTICS POWER ON pushbutton on Test Control panel and pushbutton shall go out.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

5. Press the OIA ON/ISS POWER DISABLED pushbutton.

6. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

7. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shut down of the test station is desired, proceed to step B.8.

8. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

9. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12204
REV. C
INITIAL TDRR

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE

SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication =	a
	Time of day =	b
12	Row 1 indication =	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ________ hours	d
	Time to overflow = 23.3 - line d = ________ hours	e
	Time of overflow = line b + line e = ________	

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM | **JDC** 12204 **REV.** D **PAGE** 1 **OF** 3
INITIAL TDRR 29882 **D.S. PGS** 1

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-
C	11-10-66	31886	2,3	-	EA	-
D	12-28-66	32477	2,3	-	JP	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A.5. with the following exceptions:

a. If the G & N system has been in the power off state for less than five days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90° with IMU mounting fixture set at 32.5°) and the system has not been moved, allow

VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM | **JDC** 12204 **REV** D **PAGE** 2 **OF** 3

SUBSYSTEM G & N SYSTEM | **ASSY**

90 seconds to elapse before proceeding.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

7. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM | **JDC** 12204 **REV** D **PAGE** 3 **OF** 3

SUBSYSTEM G & N SYSTEM | **ASSY**

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR
Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +09000 ENTR
g. Wait 60 seconds

3. Insure that OPTICS POWER ON pushbutton is not lighted. If it is lighted, press OPTICS POWER ON pushbutton on Test Control panel and pushbutton shall go out.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

5. Press the OIA ON/ISS POWER DISABLED pushbutton.

6. Perform the following DSKY operations:

VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY indicator lights.

7. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

8. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shut down of the test station is desired, proceed to step B.9.

9. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

10. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

FORM 00144
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication =	a
	Time of day =	b
12	Row 1 indication =	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ______ hours	d
	Time to overflow = 23.3 - line d = ______ hours	e
	Time of overflow = line b + line e = ______	

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV. D PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-
C	11-10-66	31886	2,3	-	EA	-
D	12-28-66	32477	2,3	-	JP	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A.5. with the following exceptions:

a. If the G & N system has been in the power off state for less than five days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90° with IMU mounting fixture set at 32.5°) and the system has not been moved, allow

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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90 seconds to elapse before proceeding.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

7. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

---

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication
from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR
Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +09000 ENTR
g. Wait 60 seconds

3. Insure that OPTICS POWER ON pushbutton is not lighted. If it is lighted, press OPTICS POWER ON pushbutton on Test Control panel and pushbutton shall go out.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

5. Press the OIA ON/ISS POWER DISABLED pushbutton.

6. Perform the following DSKY operations:

VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY indicator lights.

7. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

8. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shut down of the test station is desired, proceed to step B.9.

9. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

10. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12204
REV. D
INITIAL TDRR

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE

SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication =	a
	Time of day =	b
12	Row 1 indication =	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ________ hours	d
	Time to overflow = 23.3 - line d = ________ hours	e
	Time of overflow = line b + line e = ________	

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM
JDC 12204 REV. E PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-
C	11-10-66	31886	2,3	-	EA	-
D	12-28-66	32477	2,3	-	JP	-
E	10-26-67	34936	3	All	EA	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A.5. with the following exceptions:

a. If the G & N system has been in the power off state for less than five days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90° with IMU mounting fixture set at 32.5°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM
JDC 12204 REV E PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM
ASSY

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

7. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

DATE 30 JUN 66

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM
JDC 12204 REV E PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM
ASSY

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +09000 ENTR
g. Wait 60 seconds

3. Insure that OPTICS POWER ON pushbutton is not lighted. If it is lighted, press OPTICS POWER ON pushbutton on Test Control panel and pushbutton shall go out.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

5. Press the OIA ON/ISS POWER DISABLED pushbutton.

5A. Perform following DSKY operations:

a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00015 ENTR
d. Observe all status lamps are off.

6. Perform the following DSKY operations:

VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY indicator lights.

7. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

8. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shut down of the test station is desired, proceed to step B.9.

9. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

10. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12204
REV. E
INITIAL TDRR

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication = _ _ _ _ _	a
	Time of day = ______ hours ______ minutes	b
12	Row 1 indication = _ _ _ _ _	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___ • ___ hours	d
	Time to overflow = 23.3 - line d = ___ • ___ hours	e
	Line e converted to hours and minutes = ______ hours ______ minutes	
	Time of overflow = line b + line f = ______ hours ______ minutes	

DATE 30 JUN 66

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV. F PAGE 1 OF 4

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-
C	11-10-66	31886	2,3	-	EA	-
D	12-28-66	32477	2,3	-	JP	-
E	10-26-67	34936	3	All	EA	-
F	11-9-67	35019	3	-	EA	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A.5. with the following exceptions:

a. If the G & N system has been in the power off state for less than five days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90° with IMU mounting fixture set at 32.5°) and the system has not been moved, allow

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV F PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

90 seconds to elapse before proceeding.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

7. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV F PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +09000 ENTR
g. Wait 60 seconds

3. Insure that OPTICS POWER ON pushbutton is not lighted. If it is lighted, press OPTICS POWER ON pushbutton on Test Control panel and pushbutton shall go out.

4. Perform the following DSKY operations:

a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00015 ENTR
d. Observe all caution and alarm indicators are out.

5. Press the PROCEED/ ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

6. Perform the following DSKY operations:

a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00015 ENTR
d. Observe all caution and alarm indicators are out.

NOTE: If a lower mode than ISS Standby is desired, proceed.

7. Press the OIA/ ISS POWER DISABLED pushbutton.

8. Perform following DSKY operations:

a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00015 ENTR
d. Observe all status lamps are off.

9. Perform the following DSKY operations:

VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY indicator lights.

10. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

11. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the

DATE 30 JUN 66

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV F PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shut down of the test station is desired, proceed to step B. 12.

12. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

13. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12204
REV. F
INITIAL TDRR ____

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication = __ __ __ __ __	a
	Time of day = ____ hours ____ minutes	b
12	Row 1 indication = __ __ __ __ __	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___ . ___ hours	d
	Time to overflow = 23.3 - line d = ___ . ___ hours	e
	Line e converted to hours and minutes = ____ hours ____ minutes	
	Time of overflow = line b + line f = ____ hours ____ minutes	

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV. G PAGE 1 OF 4

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-
C	11-10-66	31886	2,3	-	EA	-
D	12-28-66	32477	2,3	-	JP	-
E	10-26-67	34936	3	All	EA	-
F	11-9-67	35019	3	-	EA	-
G	1-4-68	35352	3,4	-	EA	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A.5. with the following exceptions:

a. If the G & N system has been in the power off state for less than five days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90° with IMU mounting fixture set at 32.5°) and the system has not been moved, allow

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV G PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

90 seconds to elapse before proceeding.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

7. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR

00003 ENTR

Record the indication of Row 1 and the time of day.

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV G PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR

01300 ENTR

Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR

01300 ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

c. +00000 ENTR

d. +00000 ENTR

e. +09000 ENTR

f. Wait 60 seconds

3. Insure that OPTICS POWER ON pushbutton on Test Control panel is not lighted.

4. Press PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

5. Perform the following DSKY operations:

a. VERB 57 ENTR

b. Observe

VERB 21 NOUN 01 Flashing

c. 00015 ENTR

NOTE: If a lower mode than ISS Standby is desired, proceed to next step.

6. Press OIA/ISS POWER DISABLED pushbutton. The AUX HTR PWR indicator on Temperature Monitor Control panel shall light. Record the time off in system log.

7. Perform the following DSKY operations:

a. VERB 57 ENTR

b. Observe

VERB 21 NOUN 01 Flashing

00015 ENTR

8. Perform the following DSKY operations:

VERB 60. ENTR

Press and hold the STBY pushbutton until the STBY indicator lights.

9. Press CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed to next step.

10. Press POWER OFF pushbutton on Test Control panel of OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light.

NOTE: If shut down of the test station is desired, proceed to next step.

DATE

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV G PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

11. Set Main Power switch on the G & N Coolant and Power Console to OFF.

12. Set TEST SET and STATION power switches on Power Control panel of CTS to OFF.

DATE

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12204
REV. G
INITIAL TDRR ____

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication = __ __ __ __ __	a
	Time of day = ____ hours ____ minutes	b
12	Row 1 indication = __ __ __ __ __	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___ . ___ hours	d
	Time to overflow = 23.3 - line d = ___ . ___ hours	e
	Line e converted to hours and minutes = ____ hours ____ minutes	
	Time of overflow = line b + line f = ____ hours ____ minutes	

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12204
REV. H
INITIAL TORR ____

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication = _ _ _ _ _	a
	Time of day = ____ hours ____ minutes	b
12	Row 1 indication = _ _ _ _ _	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___ . ___ hours	d
	Time to overflow = 23.3 - line d = ___ . ___ hours	e
	Line e converted to hours and minutes = ____ hours ____ minutes	
	Time of overflow = line b + line f = ____ hours ____ minutes	

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM | JDC 12204 REV. H PAGE 1 OF 4
INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-
C	11-10-66	31886	2,3	-	EA	-
D	12-28-66	32477	2,3	-	JP	-
E	10-26-67	34936	3	All	EA	-
F	11-9-67	35019	3	-	EA	-
G	1-4-68	35352	3,4	-	EA	-
H	2-2-68	35556	2, 3	-	EA	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A.5. with the following exceptions:

a. If the G & N system has been in the power off state for less than five days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90° with IMU mounting fixture set at 32.5°) and the system has not been moved, allow

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM | JDC 12204 REV H PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

90 seconds to elapse before proceeding.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before

4. Insure STBY indicator on DSKY is not lighted. If it is, press and hold PRO (or STBY) pushbutton until STBY indicator goes out. Press RSET pushbutton.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

7. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01	NOUN 10	ENTR
00003		ENTR

Record the indication of Row 1 and the time of day.

DATE 30 JUN 66

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM | JDC 12204 REV H PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

11. Perform the following DSKY operations:

VERB 21	NOUN 01	ENTR
01300		ENTR
Row 1 indication from step 10		ENTR

12. Perform the following DSKY operations:

VERB 06	NOUN 02	ENTR
01300		ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	+00000		ENTR
d.	+00000		ENTR
e.	+09000		ENTR

f. Wait 60 seconds

3. Insure that OPTICS POWER ON pushbutton on Test Control panel is not lighted.

4. Press PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

5. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	Observe		
	VERB 21	NOUN 01	Flashing
c.	00015		ENTR

NOTE: If a lower mode than ISS Standby is desired, proceed to next step.

6. Press OIA/ISS POWER DISABLED pushbutton. The AUX HTR PWR indicator on Temperature Monitor Control panel shall light. Record the time off in system log.

7. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	Observe		
	VERB 21	NOUN 01	Flashing
	00015		ENTR

8. Perform the following DSKY operations:

VERB 60	ENTR

Press and hold the PRO (or STBY) pushbutton until the STBY indicator lights.

9. Press CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed to next step.

10. Press POWER OFF pushbutton on Test Control panel of OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light.

NOTE: If shut down of the test station is desired, proceed to next step.

DATE ________

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM | JDC 12204 REV H PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

11. Set Main Power switch on the G & N Coolant and Power Console to OFF.

12. Set TEST SET and STATION power switches on Power Control panel of CTS to OFF.

DATE ________

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV. J PAGE 1 OF 4
INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-
C	11-10-66	31886	2,3	-	EA	-
D	12-28-66	32477	2,3	-	JP	-
E	10-26-67	34936	3	All	EA	-
F	11-9-67	35019	3	-	EA	-
G	1-4-68	35352	3,4	-	EA	-
H	2-2-68	35556	2, 3	-	EA	-
J	6-13-68	36333	1-3	-	EA	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

NOTE: Insure that connector assembly (2003099) is removed and cable W226 is connected to the CGC test connector if required by JDC's to be performed.

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A. 5. with the following exceptions:

a. If the G & N system has been in the power off state

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

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SUBSYSTEM G & N SYSTEM

ASSY

for less than five days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90° with IMU mounting fixture set at 32.5°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

4. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the System log the number of times pressed. Press RSET pushbutton.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

7. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12204 REV J PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
Wait 5 seconds
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR
i. Observe:
VERB 41 NOUN 22 Displayed
j. VERB 36 ENTR
k. VERB 41 NOUN 20 ENTR
l. Observe:
VERB 21 NOUN 22 Flashing
m. +00000 ENTR
n. Observe:
VERB 22 NOUN 22 Flashing
o. +00000 ENTR
p. Observe:
VERB 23 NOUN 22 Flashing
q. +09000 ENTR
r. Wait 60 seconds

3. Insure that OPTICS POWER ON pushbutton on Test Control panel is not lighted.

4. Press PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

5. Perform the following DSKY operations:

a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00015 ENTR

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

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SUBSYSTEM G & N SYSTEM

ASSY

NOTE: If a lower mode than ISS Standby is desired, proceed to next step.

6. Press OIA/ISS POWER DISABLED pushbutton. The AUX HTR PWR indicator on Temperature Monitor Control panel shall light. Record the time off in system log.

7. Perform the following DSKY operations:

a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
00015 ENTR

8. Perform the following DSKY operations:

VERB 60 ENTR

Press and hold the PRO (or STBY) pushbutton until the STBY indicator lights.

9. Press CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed to next step.

10. Press POWER OFF pushbutton on Test Control panel of OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light.

NOTE: If shut down of the test station is desired, proceed to next step.

11. Set Main Power switch on the G & N Coolant and Power Console to OFF.

12. Set TEST SET and STATION power switches on Power Control panel of CTS to OFF.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

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NO. 12204
REV. J
INITIAL TDRR ______

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication = _ _ _ _ _	a
	Time of day = ______ hours ______ minutes	b
12	Row 1 indication = _ _ _ _ _	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___.___ hours	d
	Time to overflow = 23.3 - line d = ___.___ hours	e
	Line e converted to hours and minutes = ______ hours ______ minutes	
	Time of overflow = line b + line f = ______ hours ______ minutes	

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM | JDC 12204 REV. K PAGE 1 OF 4
INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-
C	11-10-66	31886	2,3	-	EA	-
D	12-28-66	32477	2,3	-	JP	-
E	10-26-67	34936	3	All	EA	-
F	11-9-67	35019	3	-	EA	-
G	1-4-68	35352	3,4	-	EA	-
H	2-2-68	35556	2, 3	-	EA	-
J	6-13-68	36333	1-3	-	EA	-
K	4-21-69	37528	All	-	EA	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

NOTE: Insure that connector assembly (2003099) is removed and cable W226 is connected to the CGC test connector if required by JDC's to be performed.

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A.5. with the following exceptions:

a. If the IMU OPERATE power has been applied to

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the G & N system through normal JDC procedures and the IMU gimbals have been positioned such that the PIPA and IRIG output axes are horizontal ±1° not in excess of twelve days or the IMU gimbals have been positioned such that the output axes are horizontal ±5° not in excess of five days, and the IMU gimbals have not been moved since parking, CGC power shall be applied with the IMU standby power for a minimum of fifteen minutes.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

4. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the System log the number of times pressed. Press RSET pushbutton.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

7. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests,

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erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR
Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
Wait 5 seconds
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR
i. Observe:
VERB 41 NOUN 22 Displayed
j. VERB 36 ENTR
k. VERB 41 NOUN 20 ENTR
l. Observe:
VERB 21 NOUN 22 Flashing
m. +00000 ENTR
n. Observe:
VERB 22 NOUN 22 Flashing
o. +00000 ENTR
p. Observe:
VERB 23 NOUN 22 Flashing
q. +09000 ENTR
r. Wait 60 seconds

3. Insure that OPTICS POWER ON pushbutton on Test Control panel is not lighted.

NOTE: If a PIPA fail indication occurs when the PROCEED/ISS STANDBY pushbutton is pressed, reset alarm and continue testing. PIPA fail is indicated by VERB 05 NOUN 31

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flashing and Row 1 indicating 00212.

4. Press PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

5. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR
j. 20000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR

NOTE: If a lower mode than ISS Standby is desired, proceed to next step.

6. Press OIA/ISS POWER DISABLED pushbutton. The AUX HTR PWR indicator on Temperature Monitor Control panel shall light. Record the time off in system log.

7. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR
j. 20000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR

8. Perform the following DSKY operations:

VERB 60 ENTR

Press and hold the PRO (or STBY) pushbutton until the STBY indicator lights.

9. Press CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed to next step.

10. Press POWER OFF pushbutton on Test Control panel of OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light.

NOTE: If shut down of the test station is desired, proceed to next step.

11. Set Main Power switch on the G & N Coolant and Power Console to OFF.

12. Set TEST SET and STATION power switches on Power Control panel of CTS to OFF.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12204
REV. K
INITIAL TDRR ____

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication = _ _ _ _ _ _	a
	Time of day = ____ hours ____ minutes	b
12	Row 1 indication = _ _ _ _ _ _	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = __ . __ hours	d
	Time to overflow = 23.3 - line d = __ . __ hours	e
	Line e converted to hours and minutes = ____ hours ____ minutes	
	Time of overflow = line b + line f = ____ hours ____ minutes	

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

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INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	10-20-66	31608	3	1	EA	-
B	11-3-66	31777	1	-	EA	-
C	11-10-66	31886	2,3	-	EA	-
D	12-28-66	32477	2,3	-	JP	-
E	10-26-67	34936	3	All	EA	-
F	11-9-67	35019	3	-	EA	-
G	1-4-68	35352	3,4	-	EA	-
H	2-2-68	35556	2, 3	-	EA	-
J	6-13-68	36333	1-3	-	EA	-
K	4-21-69	37528	All	-	EA	-
L	6-17-69	37660	4	-	EA	-

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

NOTE: Insure that connector assembly (2003099) is removed and cable W226 is connected to the CGC test connector if required by JDC's to be performed.

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

NOTE: Allow 2 hours to elapse before proceeding to step A.5. with the following exceptions:

a. If the IMU OPERATE power has been applied to

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

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SUBSYSTEM G & N SYSTEM

ASSY

the G & N system through normal JDC procedures and the IMU gimbals have been positioned such that the PIPA and IRIG output axes are horizontal ±1° not in excess of twelve days or the IMU gimbals have been positioned such that the output axes are horizontal ±5° not in excess of five days, and the IMU gimbals have not been moved since parking, CGC power shall be applied with the IMU standby power for a minimum of fifteen minutes.

b. If the G & N system has been in power off state for less than 15 minutes with the gimbals in the unparked position, allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in power off state with gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

4. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the System log the number of times pressed. Press RSET pushbutton.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

7. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12206), the PIPA Scale Factor Tests (JDC 12217), or the PIPA Misalignment Tests (JDC 12218) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

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SUBSYSTEM G & N SYSTEM

ASSY

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
Wait 5 seconds
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR
i. Observe:
VERB 41 NOUN 22 Displayed
j. VERB 36 ENTR
k. VERB 41 NOUN 20 ENTR
l. Observe:
VERB 21 NOUN 22 Flashing
m. +00000 ENTR
n. Observe:
VERB 22 NOUN 22 Flashing
o. +00000 ENTR
p. Observe:
VERB 23 NOUN 22 Flashing
q. +09000 ENTR
r. Wait 60 seconds

3. Insure that OPTICS POWER ON pushbutton on Test Control panel is not lighted.

NOTE: If a PIPA fail indication occurs when the PROCEED/ISS STANDBY pushbutton is pressed, reset alarm and continue testing. PIPA fail is indicated by VERB 05 NOUN 31 flashing and Row 1 indicating 00212.

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JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

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SUBSYSTEM G & N SYSTEM

ASSY

4. Press PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

5. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR
j. 20000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR

NOTE: If a lower mode than ISS Standby is desired, proceed to next step.

6. Press OIA/ISS POWER DISABLED pushbutton. The AUX HTR PWR indicator on Temperature Monitor Control panel shall light. Record the time off in system log.

7. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR
j. 20000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR

8. Deleted.

9. Press CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed to next step.

10. Press POWER OFF pushbutton on Test Control panel of OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light.

NOTE: If shut down of the test station is desired, proceed to next step.

11. Set Main Power switch on the G & N Coolant and Power Console to OFF.

12. Set TEST SET and STATION power switches on Power Control panel of CTS to OFF.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

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NO. 12204
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INITIAL TDRR ______

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication = _ _ _ _ _ _	a
	Time of day = ______ hours ______ minutes	b
12	Row 1 indication = _ _ _ _ _ _	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___ . ___ hours	d
	Time to overflow = 23.3 - line d = ___ . ___ hours	e
	Line e converted to hours and minutes = ______ hours ______ minutes	
	Time of overflow = line b + line f = ______ hours ______ minutes	

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INITIAL TDRR 29882 D.S. PGS 0

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

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			JDC	D. S.	MIT	NASA

REFERENCES PS-2015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

   NOTE: Insure that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbutton on the Test Control panel.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

   NOTE: If the System has been OFF (not Standby and AGC power) for 2 or more hours, allow 2 hours before proceeding to step A.5. If the G & N System has been OFF for less than 2 hours, allow an equal time period before proceeding to step A.5.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

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SUBSYSTEM G & N SYSTEM

ASSY

5. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met.

6. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

7. 90 seconds after performing step A.6 press the OPTICS POWER ON pushbutton. The pushbutton shall light.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Adjust the G & N Mounting Fixture to a 32.5° position.

2. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 40	NOUN 20	ENTR
c.	VERB 41	NOUN 20	ENTR
d.	+00000		ENTR
e.	+00000		ENTR
f.	+09000		ENTR
g.	Wait 60 seconds		

3. Press the OPTICS POWER ON pushbutton on the Test Control panel. The pushbutton shall go out.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

   NOTE: If a lower mode than ISS Standby is desired, proceed.

5. Press the OIA ON/ISS POWER DISABLED pushbutton.

6. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons. The pushbuttons shall go out.

   NOTE: If a lower mode than OIA ON is desired, proceed.

7. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

   NOTE: If shut down of the test station is desired, proceed to step B.8.

8. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

9. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

DATE ________

JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	7-21-66	30275	All	All	EA	MB

REFERENCES PS 2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 . ENTR

Press and hold the STBY pushbutton until the STBY lamp lights.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G and N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC
2. IRIG Standby Temperature deviation CHANNEL 4-4DC

b. Insure that the CHANNEL 3DC and CHANNEL 4 DC pushbuttons on the

VERIFICATION WITH SIDL REQUIRED BEFORE USE

Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 20 mv/mm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."
2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR lamp on the Temperature Monitor Control panel is lighted.

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123.

Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-6 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS. Connect the jumper cable from the AGC CLOCK (BNC) on the Systems Interface panel of the CTS to the adjacent CLOCK (BNC) on the Interface Signals patch board.

25. Connect a jumper from the remaining CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

29. Perform the following MAIN DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RESET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

30. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set the CONTROL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the INHIBIT COMPUTER POWER FAIL Signal.

35. Using CONTROL 1, adjust the CGC 4 VDC supply voltage to 3.60 VDC. Using CONTROL 2, adjust the CGC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL 1 again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 VDC and then to 16.2. No computer failures shall occur.

36. Turn the INHIBIT COMPUTER POWER FAIL Signal off. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points:

a. 3.5V and 14.0 V
b. 4.5 V and 14.0 V
c. 4.0 V and 16.5 V
d. 4.0 V and 12.6 V

At each of points a, b, c, and d, a CGC Warning shall occur. (Other failures may occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each of the above steps and press the RSET button on the DSKY. All alarms shall go out within 60 seconds.

37. Set CONTROL 1 and CONTROL 2 switches to OFF.

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SUBSYSTEM G & N SYSTEM | ASSY

38. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

BMAG ATTITUDE SIGNALS

39. Perform the following DSKY operations:

- a. VERB 21 NOUN 10 ENTR
- b. 00013 ENTR
- c. 00200 ENTR
- d. VERB 25 NOUN 01 ENTR
- e. 00042 ENTR
- f. 77777 ENTR
- g. 77777 ENTR
- h. 77777 ENTR
- i. VERB 15 NOUN 01 ENTR
- j. 00042 ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of both DSKY's.

40. Press the SINGLE PULSE pushbutton on the XY Interface panel. The pushbutton shall light.

41. Set the AGC INPUT COUNTER switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

42. Press the SINGLE PULSE switch. After the COMP ACTY light flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE switch waiting until the COMP ACT lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010, and 00011.

43. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

44. Actuate the SINGLE PULSE pushbutton as indicated in step 62. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

45. Set the AGC INPUT COUNTER switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

46. Repeat step 62 except observe Row 2 of the DSKY for proper indications.

47. Repeat steps 63 and 64 except observe Row 2 of the DSKY for proper indications.

48. Set the AGC INPUT COUNTER switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

49. Repeat step 62 except observe Row 3 of the DSKY for proper indications.

50. Repeat steps 63 and 64 except observe Row 3 of the DSKY for proper indications.

51. Perform the following DSKY operations:

- a. VERB 21 NOUN 10 ENTR
- b. 00013 ENTR
- c. 00000 ENTR

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

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REV. A
INITIAL TDRR 29882

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE

NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		2.0		
13	28 VDC IMU Standby Bus	volts	27.50		28.50		
16	Counter indication	counts	099968		100032		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12205
REV. A

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17	3200 cps 28V feed - back voltage	volts	28.04		29.16		
23	CLOCK SYNC pulses pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	1023997		1024003		
	Printout 3	cps	1023997		1024003		
	Printout 4	cps	1023997		1024003		
	Printout 5	cps	1023997		1024003		
	Printout 6	cps	1023997		1024003		
	Printout 7	cps	1023997		1024003		
	Printout 8	cps	1023997		1024003		
	Printout 9	cps	1023997		1024003		
26	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
27	+4 VDC CGC power supply	volts dc	+3.85		+4.15		
	Noise	vp-p	0.0		0.4		
28	+14 VDC CGC power supply	volts dc	+13.8		+14.2		
	Noise	vp-p	0.0		0.4		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12205
REV. A

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	No Fail Alarms	▨	▨		▨		
36	Fail Alarms	▨	▨		▨		
1,2 3,4 8,9 10,15 19,40 41,42 43,44 45,46 47,48 49,50	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) $\times \frac{0.02V}{MM} \times \frac{2^\circ}{V} = + (\pm)$ ___ . ___ °	b
	MEAN PIPA TEMP (line a + line b) ___ . ___ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

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EQUIPMENT TEST
DATA SHEET 4 **OF** 4

JDC
NO. 12205
REV. A

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = +(±) ____ . ____°	e
	MEAN IRIG TEMP (line d + line f) ____ . ____°	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ____ . ____°	
	Line c ____ . ____°	
	Temp Difference (absolute) ____ . ____°	

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JOB STANDBY CONTROL TEST

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS

REFERENCES PS 2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY lamp lights. Observe the NO ATT lamp is lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G and N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC

2. IRIG Standby Temperature deviation CHANNEL 4-4DC

b. Insure that the CHANNEL 3DC and CHANNEL 4 DC pushbuttons on the

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 20 mv/mm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."

2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM. (3200 SUSPENSION POWER)

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123.

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JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

25. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

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JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

CGC VOLTAGE MARGIN TEST

29. Perform the following MAIN DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RESET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

30. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set the CONTROL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the INHIBIT COMPUTER POWER FAIL Signal.

35. Using CONTROL 1, adjust the CGC 4 VDC supply voltage to 3.60 VDC. Using CONTROL 2, adjust the CGC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL 1 again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 VDC and then to 16.2. No computer failures shall occur.

36. Turn the INHIBIT COMPUTER POWER FAIL Signal off. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points:

a. 3.5V and 14.0 V
b. 4.5 V and 14.0 V
c. 4.0 V and 16.5 V
d. 4.0 V and 12.6 V

At each of points a, b, c, and d, a CGC Warning shall occur. (Other failures may occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each of the above steps and press the RSET button on the DSKY. All alarms shall go out within 60 seconds.

37. Set CONTROL 1 and CONTROL 2 switches to OFF.

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JOB STANDBY CONTROL TEST | JDC 12205 REV B PAGE 5 OF 5

SUBSYSTEM G & N SYSTEM | ASSY

38. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

BMAG ATTITUDE SIGNALS

39. Perform the following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00013		ENTR
c.	00200		ENTR
d.	VERB 25	NOUN 01	ENTR
e.	00042		ENTR
f.	77777		ENTR
g.	77777		ENTR
h.	77777		ENTR
i.	VERB 15	NOUN 01	ENTR
j.	00042		ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of both DSKY's.

40. Press the SINGLE PULSE pushbutton on the XY Interface panel. The pushbutton shall light.

41. Set the AGC INPUT COUNTER switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

42. Press the SINGLE PULSE switch. After the COMP ACTY light flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE switch waiting until the COMP ACT lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010, and 00011.

43. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

44. Actuate the SINGLE PULSE pushbutton as indicated in step 62. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

45. Set the AGC INPUT COUNTER switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

46. Repeat step 62 except observe Row 2 of the DSKY for proper indications.

47. Repeat steps 63 and 64 except observe Row 2 of the DSKY for proper indications.

48. Set the AGC INPUT COUNTER switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

49. Repeat step 62 except observe Row 3 of the DSKY for proper indications.

50. Repeat steps 63 and 64 except observe Row 3 of the DSKY for proper indications.

51. Perform the following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00013		ENTR
c.	00000		ENTR

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EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12205
REV. B
INITIAL TDRR 29882

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		2.0		
13	28 VDC IMU Standby Bus	volts	27.50		28.50		
16	Counter indication	counts	099968		100032		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12205
REV. B

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17	3200 cps 28V feed - back voltage	volts	28.04		29.16		
23	CLOCK SYNC pulses pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	1023997		1024003		
	Printout 3	cps	1023997		1024003		
	Printout 4	cps	1023997		1024003		
	Printout 5	cps	1023997		1024003		
	Printout 6	cps	1023997		1024003		
	Printout 7	cps	1023997		1024003		
	Printout 8	cps	1023997		1024003		
	Printout 9	cps	1023997		1024003		
26	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
27	+4 VDC CGC power supply	volts dc	+3.85		+4.15		
	Noise	vp-p	0.0		0.4		
28	+14 VDC CGC power supply	volts dc	+13.8		+14.2		
	Noise	vp-p	0.0		0.4		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
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JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	No Fail Alarms	▨	▨		▨		
36	Fail Alarms	▨	▨		▨		
1, 2 3, 4 8, 9 10, 15 19, 40 41, 42 43, 44 45, 46 47, 48 49, 50	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS		
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean		
	Nominal PIPA TEMP indicating set point (chart zero)	130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) $\times \frac{0.02V}{MM} \times \frac{2^\circ}{V} = + (\pm)$	___ . ___ °	b
	MEAN PIPA TEMP (line a + line b)	___ . ___ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean		
	Nominal IRIG TEMP indicating set point (chart zero)	135.00 degrees	d

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EQUIPMENT TEST
DATA SHEET 4 **OF** 4

JDC
NO. 12205
REV. B

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS		
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = +(±)	____ . ____ °	e
	MEAN IRIG TEMP (line d + line f)	____ . ____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c		
	Line f	____ . ____ °	
	Line c	____ . ____ °	
	Temp Difference (absolute)	____ . ____ °	

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JOB STANDBY CONTROL TEST

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INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS
C	11-10-66	31885	1,2,4,5	-	EA	-

REFERENCES PS 2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY lamp lights. Observe the NO ATT lamp is lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC
2. IRIG Standby Temperature deviation CHANNEL 4-4DC

b. Insure that the CH 3 DC and CH 4 DC

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB STANDBY CONTROL TEST

JDC 12205 REV C PAGE 2 OF 5

SUBSYSTEM G & N SYSTEM

ASSY

pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 20 mv/mm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."
2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123.

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JOB STANDBY CONTROL TEST

JDC 12205 REV C PAGE 3 OF 5

SUBSYSTEM G & N SYSTEM

ASSY

Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

25. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

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JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

CGC VOLTAGE MARGIN TEST

29. Perform the following DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RSET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

30. Set the STRT 1 STRT 2 switch on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTRL 1 and CONTRL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to AGC (+4) +3V and adjust the CONTRL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 1 switch to OFF; turn CONTRL 1 fully counterclockwise and back to midrange; set the CONTRL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to AGC (+14) +13V and adjust the CONTRL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 2 switch to OFF; turn CONTRL 2 fully counterclockwise and back to midrange; set the CONTRL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Press INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel. The pushbutton shall light.

35. Using CONTRL 1, adjust the CGC 4 VDC supply voltage to 3.60 VDC. Using CONTRL 2, adjust the CGC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTRL 1 again to adjust the 4 volt supply to 4.5 volts. Use CONTRL 2 to adjust the 14 volt supply to 12.6 VDC and then to 16.2. No computer failures shall occur.

36. Turn the INHIBIT COMPUTER POWER FAIL Signal off. Using CONTRL 1 and CONTRL 2 set the computer 4 and 14 volt supplies to the following points:

a. 3.5V and 14.0 V
b. 4.5 V and 14.0 V
c. 4.0 V and 16.5 V
d. 4.0 V and 12.6 V

At each of points a, b, c, and d, a CGC Warning shall occur. (Other failures may occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each of the above steps and press the RSET button on the DSKY. All alarms shall go out within 60 seconds.

37. Set CONTRL 1 and CONTRL 2 switches to OFF.

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JOB STANDBY CONTROL TEST JDC 12205 REV C PAGE 5 OF 5

SUBSYSTEM G & N SYSTEM ASSY

38. Deleted.

BMAG ATTITUDE SIGNALS

39. Perform the following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00013		ENTR
c.	00200		ENTR
d.	VERB 25	NOUN 01	ENTR
e.	00042		ENTR
f.	77777		ENTR
g.	77777		ENTR
h.	77777		ENTR
i.	VERB 15	NOUN 01	ENTR
j.	00042		ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

40. Press the SINGLE PULSE pushbutton on the XY interface panel. The pushbutton shall light.

41. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

42. Press the SINGLE PULSE switch. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE switch waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

43. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

44. Actuate the SINGLE PULSE switch as indicated in step 42. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

45. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

46. Repeat step 42 except observe Row 2 of the DSKY for proper indications.

47. Repeat steps 43 and 44 except observe Row 2 of the DSKY for proper indications.

48. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

49. Repeat step 42 except observe Row 3 of the DSKY for proper indications.

50. Repeat steps 43 and 44 except observe Row 3 of the DSKY for proper indications.

51. Perform the following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00013		ENTR
c.	00000		ENTR

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FORM 00144
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12205
REV. C
INITIAL TDRR 29882

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		2.0		
13	28 VDC IMU Standby Bus	volts	27.50		28.50		
16	Counter indication	counts	099968		100032		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12205
REV. C

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17	3200 cps 28V feed - back voltage	volts	28.04		29.16		
23	CLOCK SYNC pulses pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	1023997		1024003		
	Printout 3	cps	1023997		1024003		
	Printout 4	cps	1023997		1024003		
	Printout 5	cps	1023997		1024003		
	Printout 6	cps	1023997		1024003		
	Printout 7	cps	1023997		1024003		
	Printout 8	cps	1023997		1024003		
	Printout 9	cps	1023997		1024003		
26	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
27	+4 VDC CGC power supply	volts dc	+3.85		+4.15		
	Noise	vp-p	0.0		0.4		
28	+14 VDC CGC power supply	volts dc	+13.8		+14.2		
	Noise	vp-p	0.0		0.4		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12205
REV. C

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	No Fail Alarms	▨	▨		▨		
36	Fail Alarms	▨	▨		▨		
1,2 3,4 8,9 10,15 19,40 41,42 43,44 45,46 47,48 49,50	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS		
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean		
	Nominal PIPA TEMP indicating set point (chart zero)	130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = + (±)	___ . ___ °	b
	MEAN PIPA TEMP (line a + line b)	___ . ___ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean		
	Nominal IRIG TEMP indicating set point (chart zero)	135.00 degrees	d

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12205
REV. C

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = +(±) ____ . ____ °	e
	MEAN IRIG TEMP (line d + line f) ____ . ____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ____ . ____ °	
	Line c ____ . ____ °	
	Temp Difference (absolute) ____ . ____ °	

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INITIAL TDRR 29882 D.S. PGS 1

JOB STANDBY CONTROL TEST

SUBSYSTEM G & N SYSTEM
ASSY.
DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS
C	11-10-66	31885	1,2,4,5	-	EA	-
D	11-15-66	31939	1	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: OSCILLOGRAPH sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY lamp lights. Observe the NO ATT lamp is lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:
   1. PIPA Standby Temperature deviation CHANNEL 3-3DC
   2. IRIG Standby Temperature deviation CHANNEL 4-4DC

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 20 mv/mm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:
   1. CHANNEL 3 "Start of Standby PIPA Temp test."
   2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM. (3200 SUSPENSION POWER)

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123.

Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

25. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

29. Perform the following DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RSET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

30. Set the STRT 1 STRT 2 switch on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTRL 1 and CONTRL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to AGC (+4) +3V and adjust the CONTRL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 1 switch to OFF; turn CONTRL 1 fully counterclockwise and back to midrange; set the CONTRL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to AGC (+14) +13V and adjust the CONTRL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 2 switch to OFF; turn CONTRL 2 fully counterclockwise and back to midrange; set the CONTRL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Press INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel. The pushbutton shall light.

35. Using CONTRL 1, adjust the CGC 4 VDC supply voltage to 3.60 VDC. Using CONTRL 2, adjust the CGC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTRL 1 again to adjust the 4 volt supply to 4.5 volts. Use CONTRL 2 to adjust the 14 volt supply to 12.6 VDC and then to 16.2. No computer failures shall occur.

36. Turn the INHIBIT COMPUTER POWER FAIL Signal off. Using CONTRL 1 and CONTRL 2 set the computer 4 and 14 volt supplies to the following points:

a. 3.5V and 14.0 V
b. 4.5 V and 14.0 V
c. 4.0 V and 16.5 V
d. 4.0 V and 12.6 V

At each of points a, b, c, and d, a CGC Warning shall occur. (Other failures may occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each of the above steps and press the RSET button on the DSKY. All alarms shall go out within 60 seconds.

37. Set CONTRL 1 and CONTRL 2 switches to OFF.

SUBSYSTEM G & N SYSTEM | ASSY

38. Deleted.

BMAG ATTITUDE SIGNALS

39. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00200 ENTR
d. VERB 25 NOUN 01 ENTR
e. 00042 ENTR
f. 77777 ENTR
g. 77777 ENTR
h. 77777 ENTR
i. VERB 15 NOUN 01 ENTR
j. 00042 ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

40. Press the SINGLE PULSE pushbutton on the XY Interface panel. The pushbutton shall light.

41. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

42. Press the SINGLE PULSE switch. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE switch waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

43. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

44. Actuate the SINGLE PULSE switch as indicated in step 42. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

45. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

46. Repeat step 42 except observe Row 2 of the DSKY for proper indications.

47. Repeat steps 43 and 44 except observe Row 2 of the DSKY for proper indications.

48. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

49. Repeat step 42 except observe Row 3 of the DSKY for proper indications.

50. Repeat steps 43 and 44 except observe Row 3 of the DSKY for proper indications.

51. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00000 ENTR

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12205
REV. D
INITIAL TDRR 29882

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE
SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		2.0		
13	28 VDC IMU Standby Bus	volts	27.50		28.50		
16	Counter indication	counts	099968		100032		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12205
REV. D

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17	3200 cps 28V feed - back voltage	volts	28.04		29.16		
23	CLOCK SYNC pulses pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	1023997		1024003		
	Printout 3	cps	1023997		1024003		
	Printout 4	cps	1023997		1024003		
	Printout 5	cps	1023997		1024003		
	Printout 6	cps	1023997		1024003		
	Printout 7	cps	1023997		1024003		
	Printout 8	cps	1023997		1024003		
	Printout 9	cps	1023997		1024003		
26	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	µsec	0.25		0.75		
	Pulse Rise Time	µsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
27	+4 VDC CGC power supply	volts dc	+3.85		+4.15		
	Noise	vp-p	0.0		0.4		
28	+14 VDC CGC power supply	volts dc	+13.8		+14.2		
	Noise	vp-p	0.0		0.4		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12205
REV. D

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	No Fail Alarms	▨	▨		▨		
36	Fail Alarms	▨	▨		▨		
1,2 3,4 8,9 10,15 19,40 41,42 43,44 45,46 47,48 49,50	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = + (±) ___.___ °	b
	MEAN PIPA TEMP (line a + line b) ___.___ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

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EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12205
REV. D

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS		
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = +(±)	____ . ____ °	e
	MEAN IRIG TEMP (line d + line f)	____ . ____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c		
	Line f	____ . ____ °	
	Line c	____ . ____ °	
	Temp Difference (absolute)	____ . ____ °	

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JOB STANDBY CONTROL TEST | JDC 12205 REV. E PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 4
SUBSYSTEM G & N SYSTEM | ASSY.
DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS
C	11-10-66	31885	1,2,4,5	-	EA	-
D	11-15-66	31939	1	-	EA	-
E	1-12-67	32619	1,2,3,5	1,2	EA	-

REFERENCES PS 2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: OSCILLOGRAPH sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY lamp lights. Observe the NO ATT and TEMP lamps are lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC

2. IRIG Standby Temperature deviation CHANNEL 4-3DC

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b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 20 mv/mm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."

2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13A. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G&N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

13B. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER

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VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

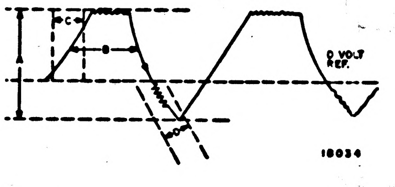
22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

25. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:



a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

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+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

29. Perform the following DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RSET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

30. Set the STRT 1 STRT 2 switch on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTRL 1 and CONTRL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to AGC (+4) +3V and adjust the CONTRL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 1 switch to OFF; turn CONTRL 1 fully counterclockwise and back to midrange; set the CONTRL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to AGC (+14) +13V and adjust the CONTRL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 2 switch to OFF; turn CONTRL 2 fully counterclockwise and back to midrange; set the CONTRL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Press INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel. The pushbutton shall light.

35. Using CONTRL 1, adjust the CGC 4 VDC supply voltage to 3.60 VDC. Using CONTRL 2, adjust the CGC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTRL 1 again to adjust the 4 volt supply to 4.5 volts. Use CONTRL 2 to adjust the 14 volt supply to 12.6 VDC and then to 16.2. No computer failures shall occur.

36. Turn the INHIBIT COMPUTER POWER FAIL Signal off. Using CONTRL 1 and CONTRL 2 set the computer 4 and 14 volt supplies to the following points:

a. 3.5V and 14.0 V

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JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
(M) A	7-21-66	30275	All	All	EA	MB
(M) B	7-28-66	30301	1,3	-	EA	WS
M C	11-10-66	31885	1,2,4,5	-	EA	-
(M) D	11-15-66	31939	1	-	EA	-
E	1-12-67	32619	1,2,3,5	1,2	EA	-

REFERENCES PS 2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: OSCILLOGRAPH sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY lamp lights. Observe the NO ATT and TEMP lamps are lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC

2. IRIG Standby Temperature deviation CHANNEL 4-3DC

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JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 20 mv/mm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."

2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13A. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G&N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

13B. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER

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JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

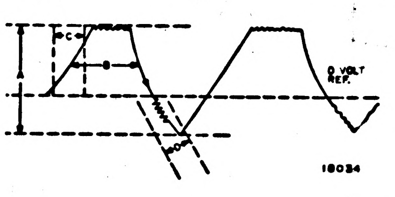
22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

25. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:



a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

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JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

29. Perform the following DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RSET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

30. Set the STRT 1 STRT 2 switch on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTRL 1 and CONTRL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to AGC (+4) +3V and adjust the CONTRL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 1 switch to OFF; turn CONTRL 1 fully counterclockwise and back to midrange; set the CONTRL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to AGC (+14) +13V and adjust the CONTRL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 2 switch to OFF; turn CONTRL 2 fully counterclockwise and back to midrange; set the CONTRL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Press INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel. The pushbutton shall light.

35. Using CONTRL 1, adjust the CGC 4 VDC supply voltage to 3.60 VDC. Using CONTRL 2, adjust the CGC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTRL 1 again to adjust the 4 volt supply to 4.5 volts. Use CONTRL 2 to adjust the 14 volt supply to 12.6 VDC and then to 16.2. No computer failures shall occur.

36. Turn the INHIBIT COMPUTER POWER FAIL Signal off. Using CONTRL 1 and CONTRL 2 set the computer 4 and 14 volt supplies to the following points:

a. 3.5V and 14.0 V

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b. 4.5 V and 14.0 V
c. 4.0 V and 16.5 V
d. 4.0 V and 12.6 V

At each of points a, b, c, and d, a CGC Warning shall occur. (Other failures may occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each of the above steps and press the RSET button on the DSKY. All alarms shall go out within 60 seconds.

37. Set CONTRL 1 and CONTRL 2 switches to OFF.

38. Deleted.

BMAG ATTITUDE SIGNALS

39. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00200 ENTR
d. VERB 25 NOUN 01 ENTR
e. 00042 ENTR
f. 77777 ENTR
g. 77777 ENTR
h. 77777 ENTR
i. VERB 15 NOUN 01 ENTR
j. 00042 ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

40. Press the SINGLE PULSE pushbutton on the XY Interface panel. The pushbutton shall light.

41. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

42. Press the SINGLE PULSE switch. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE switch waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

43. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

44. Actuate the SINGLE PULSE switch as indicated in step 42. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

45. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

46. Repeat step 42 except observe Row 2 of the DSKY for proper indications.

47. Repeat steps 43 and 44 except observe Row 2 of the DSKY for proper indications.

48. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

---

49. Repeat step 42 except observe Row 3 of the DSKY for proper indications.

50. Repeat steps 43 and 44 except observe Row 3 of the DSKY for proper indications.

51. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00000 ENTR
d. VERB 57 ENTR
e. 00015 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12205
REV. E
INITIAL TDRR 29382

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		2.0		
13A	28 VDC STANDBY	VDC	27.8		29.8		
13B	28 VDC IMU Standby Bus	VDC	25.80		31.80		
16	Counter indication	counts	099968		100032		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12205
REV. E

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17	3200 cps 28V feed - back voltage	volts	28.04		29.16		
23	CLOCK SYNC pulses pulses Printout 1	cps	XXXX2399700		XXXX2400300		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
26	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	µsec	0.25		0.75		
	Pulse Rise Time	µsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
27	+4 VDC CGC power supply	volts dc	+3.85		+4.15		
	Noise	vp-p	0.0		0.4		
28	+14 VDC CGC power supply	volts dc	+13.8		+14.2		
	Noise	vp-p	0.0		0.4		

JOB STANDBY CONTROL TEST | JDC 12205 REV E PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

b. 4.5 V and 14.0 V
c. 4.0 V and 16.5 V
d. 4.0 V and 12.6 V

At each of points a, b, c, and d, a CGC Warning shall occur. (Other failures may occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each of the above steps and press the RSET button on the DSKY. All alarms shall go out within 60 seconds.

37. Set CONTRL 1 and CONTRL 2 switches to OFF.

38. Deleted.

BMAG ATTITUDE SIGNALS

39. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00200 ENTR
d. VERB 25 NOUN 01 ENTR
e. 00042 ENTR
f. 77777 ENTR
g. 77777 ENTR
h. 77777 ENTR
i. VERB 15 NOUN 01 ENTR
j. 00042 ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

40. Press the SINGLE PULSE pushbutton on the XY Interface panel. The pushbutton shall light.

41. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

42. Press the SINGLE PULSE switch. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE switch waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

43. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

44. Actuate the SINGLE PULSE switch as indicated in step 42. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

45. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

46. Repeat step 42 except observe Row 2 of the DSKY for proper indications.

47. Repeat steps 43 and 44 except observe Row 2 of the DSKY for proper indications.

48. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

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JOB STANDBY CONTROL TEST | JDC 12205 REV E PAGE 6 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

49. Repeat step 42 except observe Row 3 of the DSKY for proper indications.

50. Repeat steps 43 and 44 except observe Row 3 of the DSKY for proper indications.

51. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00000 ENTR
d. VERB 57 ENTR
e. 00015 ENTR

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12205
REV. E
INITIAL TDRR 29382

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		2.0		
13A	28 VDC STANDBY	VDC	27.8		29.8		
13B	28 VDC IMU Standby Bus	VDC	25.80		31.80		
16	Counter indication	counts	099968		100032		

DATE 30 JUN 66

FORM 00146
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12205
REV. E

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17	3200 cps 28V feed - back voltage	volts	28.04		29.16		
23	CLOCK SYNC pulses pulses Printout 1	cps	XXXX2399700		XXXX2400300		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
26	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
27	+4 VDC CGC power supply	volts dc	+3.85		+4.15		
	Noise	vp-p	0.0		0.4		
28	+14 VDC CGC power supply	volts dc	+13.8		+14.2		
	Noise	vp-p	0.0		0.4		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 2205
REV. E

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	No Fail Alarms	▨	▨		▨		
36	Fail Alarms	▨	▨		▨		
1,2 3,4 8,9 10,15 19,40 41,42 43,44 45,46 47,48 49,50	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = + (±) ___ . ___ °	b
	MEAN PIPA TEMP (line a + line b) ___ . ___ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

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EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12205
REV. E

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = +(±) ___ . ___ °	e
	MEAN IRIG TEMP (line d + line f) ___ . ___ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ___ . ___ °	
	Line c ___ . ___ °	
	Temp Difference (absolute) ___ . ___ °	

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FORM 00148
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4.

JDC
NO. 12205
REV. E

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	No Fail Alarms	▨	▨		▨		
36	Fail Alarms	▨	▨		▨		
1, 2 3, 4 8, 9 10, 15 19, 40 41, 42 43, 44 45, 46 47, 48 49, 50	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130. 00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = + (±) ____ . ____ °	b
	MEAN PIPA TEMP (line a + line b) ____ . ____ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135. 00 degrees	d

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FORM 00117
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12205
REV. E

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = +(±) ____ . ____ °	e
	MEAN IRIG TEMP (line d + line f) ____ . ____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ____ . ____ °	
	Line c ____ . ____ °	
	Temp Difference (absolute) ____ . ____ °	

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FORM 00118
Chg. 7-23-65

JOB STANDBY CONTROL TEST

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INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM
ASSY.
DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS
C	11-10-66	31885	1,2,4,5	-	EA	-
D	11-15-66	31939	1	-	EA	-
E	1-12-67	32619	1,2,3,5	1,2	EA	-
F	3-9-67	33186	5	-	EA	-

REFERENCES PS 20 .5000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: OSCILLOGRAPH sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY lamp lights. Observe the NO ATT and TEMP lamps are lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC
2. IRIG Standby Temperature deviation CHANNEL 4-3DC

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB STANDBY CONTROL TEST

JDC 12205 REV F PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM
ASSY

b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 20 mv/mm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."
2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13A. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G&N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

13B. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER

DATE 30 JUN 66

JOB STANDBY CONTROL TEST

JDC 12205 REV F PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM
ASSY

VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

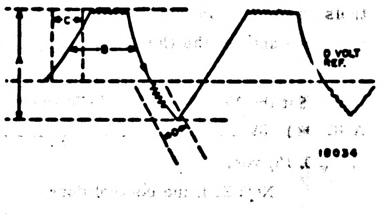
22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

25. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:



a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

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JOB STANDBY CONTROL TEST

JDC 12205 REV F PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM
ASSY

+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

29. Perform the following DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RSET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

30. Set the STRT 1 STRT 2 switch on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTRL 1 and CONTRL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to AGC (+4) +3V and adjust the CONTRL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 1 switch to OFF; turn CONTRL 1 fully counterclockwise and back to midrange; set the CONTRL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to AGC (+14) +13V and adjust the CONTRL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 2 switch to OFF; turn CONTRL 2 fully counterclockwise and back to midrange; set the CONTRL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Press INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel. The pushbutton shall light.

35. Using CONTRL 1, adjust the CGC 4 VDC supply voltage to 3.60 VDC. Using CONTRL 2, adjust the CGC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTRL 1 again to adjust the 4 volt supply to 4.5 volts. Use CONTRL 2 to adjust the 14 volt supply to 12.6 VDC and then to 16.2. No computer failures shall occur.

36. Turn the INHIBIT COMPUTER POWER FAIL Signal off. Using CONTRL 1 and CONTRL 2 set the computer 4 and 14 volt supplies to the following points:

a. 3.5V and 14.0 V

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b. 4.5 V and 14.0 V
c. 4.0 V and 16.5 V
d. 4.0 V and 12.6 V

NOTE: Fail indications occur only with the MAIN DSKY installed for test or with cable W-160 (P3) connected to the DSKY.

At each of points a, b, c, and d, a CGC Warning shall occur. (Other failures may occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each of the above steps and press the RSET button on the DSKY. All alarms shall go out within 60 seconds.

37. Set CONTRL 1 and CONTRL 2 switches to OFF.

38. Deleted.

BMAG ATTITUDE SIGNALS

39. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00200 ENTR
d. VERB 25 NOUN 01 ENTR
e. 00042 ENTR
f. 77777 ENTR
g. 77777 ENTR
h. 77777 ENTR
i. VERB 15 NOUN 01 ENTR
j. 00042 ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

40. Press the SINGLE PULSE pushbutton on the XY Interface panel. The pushbutton shall light.

41. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

42. Press the SINGLE PULSE switch. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE switch waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

43. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

44. Actuate the SINGLE PULSE switch as indicated in step 42. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

45. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

46. Repeat step 42 except observe Row 2 of the DSKY for proper indications.

47. Repeat steps 43 and 44 except observe Row 2 of the DSKY for proper indications.

---

48. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

49. Repeat step 42 except observe Row 3 of the DSKY for proper indications.

50. Repeat steps 43 and 44 except observe Row 3 of the DSKY for proper indications.

51. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00000 ENTR
d. VERB 57 ENTR
e. 00015 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12205
REV. F
INITIAL TDRR 29882

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ____________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE
NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION   APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		2.0		
13A	28 VDC STANDBY	VDC	27.8		29.8		
13B	28 VDC IMU Standby Bus	VDC	25.80		31.80		
16	Counter indication	counts	099968		100032		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12205
REV. F

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17	3200 cps 28V feed-back voltage	volts	28.04		29.16		
23	CLOCK SYNC pulses pulses Printout 1	cps	XXXX2399700		XXXX2400300		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
26	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
27	+4 VDC CGC power supply	volts dc	+3.85		+4.15		
	Noise	vp-p	0.0		0.4		
28	+14 VDC CGC power supply	volts dc	+13.8		+14.2		
	Noise	vp-p	0.0		0.4		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 4

JDC
NO. 12205
REV. F

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	No Fail Alarms	▨	▨		▨		
36	Fail Alarms	▨	▨		▨		
1, 2 3, 4 8, 9 10, 15 19, 40 41, 42 43, 44 45, 46 47, 48 49, 50	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2^\circ}{V}$ = + (±) ____.____ °	b
	MEAN PIPA TEMP (line a + line b) ____.____ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 4

JDC
NO. 12205
REV. F

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2^\circ}{V}$ = +(±) ____.____ °	e
	MEAN IRIG TEMP (line d + line f) ____.____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ____.____ °	
	Line c ____.____ °	
	Temp Difference (absolute) ____.____ °	

DATE 30 JUN 66

FORM 1014S
Chg. 7-23-6

JOB STANDBY CONTROL TEST

JDC 12205 REV. G PAGE 1 OF 6
INITIAL TDRR 29882 D.S PGS 4

SUBSYSTEM G & N SYSTEM
ASSY.
DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS
C	11-10-66	31885	1,2,4,5	-	EA	-
D	11-15-66	31939	1	-	EA	-
E	1-12-67	32619	1,2,3,5	1,2	EA	-
F	3-9-67	33186	5	-	EA	-
G	5-4-67	33717	-	2	EA	-

REFERENCES PS 2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: OSCILLOGRAPH sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY lamp lights. Observe the NO ATT and TEMP lamps are lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC.
2. IRIG Standby Temperature deviation CHANNEL 4-3DC

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 20 mv/mm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."
2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13A. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G&N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

13B. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER

VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

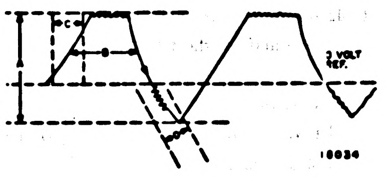
22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

25. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:



a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

29. Perform the following DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RSET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

30. Set the STRT 1 STRT 2 switch on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTRL 1 and CONTRL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to AGC (+4) +3V and adjust the CONTRL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 1 switch to OFF; turn CONTRL 1 fully counterclockwise and back to midrange; set the CONTRL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to AGC (+14) +13V and adjust the CONTRL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 2 switch to OFF; turn CONTRL 2 fully counterclockwise and back to midrange; set the CONTRL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Press INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel. The pushbutton shall light.

35. Using CONTRL 1, adjust the CGC 4 VDC supply voltage to 3.60 VDC. Using CONTRL 2, adjust the CGC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTRL 1 again to adjust the 4 volt supply to 4.5 volts. Use CONTRL 2 to adjust the 14 volt supply to 12.6 VDC and then to 16.2. No computer failures shall occur.

36. Turn the INHIBIT COMPUTER POWER FAIL Signal off. Using CONTRL 1 and CONTRL 2 set the computer 4 and 14 volt supplies to the following points:

a. 3.5V and 14.0 V

b. 4.5 V and 14.0 V
c. 4.0 V and 16.5 V
d. 4.0 V and 12.6 V

NOTE: Fail indications occur only with the MAIN DSKY installed for test or with cable W-160 (P3) connected to the DSKY.

At each of points a, b, c, and d, a CGC Warning shall occur. (Other failures may occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each of the above steps and press the RSET button on the DSKY. All alarms shall go out within 60 seconds.

37. Set CONTRL 1 and CONTRL 2 switches to OFF.

38. Deleted.

BMAG ATTITUDE SIGNALS

39. Perform the following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00013		ENTR
c.	00200		ENTR
d.	VERB 25	NOUN 01	ENTR
e.	00042		ENTR
f.	77777		ENTR
g.	77777		ENTR
h.	77777		ENTR
i.	VERB 15	NOUN 01	ENTR
j.	00042		ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

40. Press the SINGLE PULSE pushbutton on the XY Interface panel. The pushbutton shall light.

41. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

42. Press the SINGLE PULSE switch. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE switch waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

43. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

44. Actuate the SINGLE PULSE switch as indicated in step 42, Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

45. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

46. Repeat step 42 except observe Row 2 of the DSKY for proper indications.

47. Repeat steps 43 and 44 except observe Row 2 of the DSKY for proper indications.

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48. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

49. Repeat step 42 except observe Row 3 of the DSKY for proper indications.

50. Repeat steps 43 and 44 except observe Row 3 of the DSKY for proper indications.

51. Perform the following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00013		ENTR
c.	00000		ENTR
d.	VERB 57		ENTR
e.	00015		ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12205
REV. G
INITIAL TDRR 29882

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp. (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		2.0		
13A	28 VDC STANDBY	VDC	27.8		29.8		
13B	28 VDC IMU Standby Bus	VDC	25.80		31.80		
16	Counter indication	counts	099968		100032		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12205
REV. G

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17	3200 cps 28V feed - back voltage	volts	28.04		29.16		
23	CLOCK SYNC pulses pulses Printout 1	cps	XXXX2399800		XXXX2400200		
	Printout 2	cps	XXXX2399800		XXXX2400200		
	Printout 3	cps	XXXX2399800		XXXX2400200		
	Printout 4	cps	XXXX2399800		XXXX2400200		
	Printout 5	cps	XXXX2399800		XXXX2400200		
	Printout 6	cps	XXXX2399800		XXXX2400200		
	Printout 7	cps	XXXX2399800		XXXX2400200		
	Printout 8	cps	XXXX2399800		XXXX2400200		
	Printout 9	cps	XXXX2399800		XXXX2400200		
26	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	µsec	0.25		0.75		
	Pulse Rise Time	µsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
27	+4 VDC CGC power supply	volts dc	+3.85		+4.15		
	Noise	vp-p	0.0		0.4		
28	+14 VDC CGC power supply	volts dc	+13.8		+14.2		
	Noise	vp-p	0.0		0.4		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12205
REV. G

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	No Fail Alarms	▨	▨		▨		
36	Fail Alarms	▨	▨		▨		
1,2 3,4 8,9 10,15 19,40 41,42 43,44 45,46 47,48 49,50	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = + (±) ____ . ____ °	b
	MEAN PIPA TEMP (line a + line b) ____ . ____ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12205
REV. G

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = +(±) ____ . ____ °	e
	MEAN IRIG TEMP (line d + line f) ____ . ____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ____ . ____ °	
	Line c ____ . ____ °	
	Temp Difference (absolute) ____ . ____ °	

DATE 30 JUN 66

JOB STANDBY CONTROL TEST | JDC 12205 REV. H PAGE 1 OF 6
INITIAL TDRR 29882 D.S PGS 4

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D. S.	APPROVAL MIT	APPROVAL NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1, 3	-	EA	WS
C	11-10-66	31885	1, 2, 4, 5	-	EA	-
D	11-15-66	31939	1	-	EA	-
E	1-12-67	32619	1, 2, 3, 5	1, 2	EA	-
F	3-9-67	33186	5	-	EA	-
G	5-4-67	33717	-	2	EA	-
H	6-6-67	33903	5	2	EA	-

REFERENCES PS 2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: OSCILLOGRAPH sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY lamp lights. Observe the NO ATT and TEMP lamps are lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC
2. IRIG Standby Temperature deviation CHANNEL 4-3DC

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 20 mv/mm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."
2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13A. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G&N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

13B. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

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17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

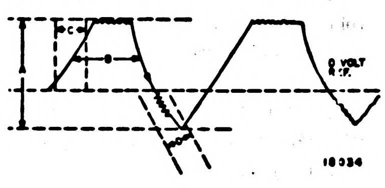
22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

25. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:



a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

29. Perform the following DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RSET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

30. Set the STRT 1 STRT 2 switch on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTRL 1 and CONTRL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to AGC (+4) +3V and adjust the CONTRL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 1 switch to OFF; turn CONTRL 1 fully counterclockwise and back to midrange; set the CONTRL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to AGC (+14) +13V and adjust the CONTRL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 2 switch to OFF; turn CONTRL 2 fully counterclockwise and back to midrange; set the CONTRL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Press INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel. The pushbutton shall light.

35. Using CONTRL 1, adjust the CGC 4 VDC supply voltage to 3.60 VDC. Using CONTRL 2, adjust the CGC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTRL 1 again to adjust the 4 volt supply to 4.5 volts. Use CONTRL 2 to adjust the 14 volt supply to 12.6 VDC and then to 16.2. No computer failures shall occur.

36. Turn the INHIBIT COMPUTER POWER FAIL Signal off. Using CONTRL 1 and CONTRL 2 set the computer 4 and 14 volt supplies to the following points:

a. 3.5V and 14.0 V

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12205
REV. H

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	No Fail Alarms	▨	▨		▨		
36	Fail Alarms	▨	▨		▨		
1,2 3,4 8,9 10,15 19,40 41,42 43,44 45,46 47,48 49,50	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = + (±) ____ . ____ °	b
	MEAN PIPA TEMP (line a + line b) ____ . ____ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

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EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12205
REV. H

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) x $\frac{0.02V}{MM}$ x $\frac{2°}{V}$ = +(±) ____ . ____ °	e
	MEAN IRIG TEMP (line d + line f) ____ . ____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ____ . ____ °	
	Line c ____ . ____ °	
	Temp Difference (absolute) ____ . ____ °	

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JOB STANDBY CONTROL TEST

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INITIAL TDRR 29882 **D.S. PGS** 4

SUBSYSTEM G & N SYSTEM
DESCRIPTION

ASSY.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS
C	11-10-66	31885	1,2,4,5	-	EA	-
D	11-15-66	31939	1	-	EA	-
E	1-12-67	32619	1,2,3,5	1,2	EA	-
F	3-9-67	33186	5	-	EA	-
G	5-4-67	33717	-	2	EA	-
H	6-6-67	33903	5	2	EA	-
J	7-20-67	34176	1	1	SB	-

REFERENCES PS 2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FOR[illegible]
Ch. [illegible]

JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

Press and hold the STBY pushbutton until the STBY lamp lights. Observe the NO ATT and TEMP lamps are lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:
   1. PIPA Standby Temperature deviation CHANNEL 3-3DC
   2. IRIG Standby Temperature deviation CHANNEL 4-3DC

b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 20 mv/mm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:
   1. CHANNEL 3 "Start of Standby PIPA Temp test."
   2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13A. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G&N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

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JOB STANDBY CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

13B. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTFN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from

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JOB STANDBY CONTROL TEST

JDC 12205 **REV** J **PAGE** 4 **OF** 6

SUBSYSTEM G & N SYSTEM

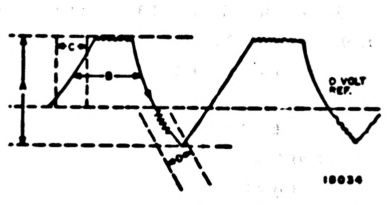
ASSY

the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

25. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:



a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

29. Perform the following DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RSET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

30. Set the STRT 1 STRT 2 switch on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTRL 1 and CONTRL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to AGC (+4) +3V and adjust the CONTRL 1 for 4.0 (±0.15) vdc.

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NOTE: If the control does not vary the voltage, set the CONTRL 1 switch to OFF; turn CONTRL 1 fully counterclockwise and back to midrange; set the CONTRL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to AGC (+14) +13V and adjust the CONTRL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTRL 2 switch to OFF; turn CONTRL 2 fully counterclockwise and back to midrange; set the CONTRL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Press INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel. The pushbutton shall light.

35. Using CONTRL 1, adjust the CGC 4 VDC supply voltage to 3.60 VDC. Using CONTRL 2, adjust the CGC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTRL 1 again to adjust the 4 volt supply to 4.5 volts. Use CONTRL 2 to adjust the 14 volt supply to 12.6 VDC and then to 16.2. No computer failures shall occur.

36. Turn the INHIBIT COMPUTER POWER FAIL Signal off. Using CONTRL 1 and CONTRL 2 set the computer 4 and 14 volt supplies to the following points:

a. 3.5V and 14.0 V
b. 4.5 V and 14.0 V
c. 4.0 V and 16.5 V
d. 4.0 V and 12.2 V

NOTE: Fail indications occur only with the MAIN DSKY installed for test or with cable W-160 (P3) connected to the DSKY.

At each of points a, b, c, and d, a CGC Warning shall occur. (Other failures may occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each of the above steps and press the RSET button on the DSKY. All alarms shall go out within 60 seconds.

37. Set CONTRL 1 and CONTRL 2 switches to OFF.

38. Deleted.

BMAG ATTITUDE SIGNALS

39. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR

---

c. 00200 ENTR
d. VERB 25 NOUN 01 ENTR
e. 00042 ENTR
f. 77777 ENTR
g. 77777 ENTR
h. 77777 ENTR
i. VERB 15 NOUN 01 ENTR
j. 00042 ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

40. Press the SINGLE PULSE switch on the XY Interface panel. The SINGLE PULSE lamp shall light.

41. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

42. Press the SINGLE PULSE pushbutton. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE pushbutton waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

43. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

44. Actuate the SINGLE PULSE pushbutton as indicated in step 42. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

45. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

46. Repeat step 42 except observe Row 2 of the DSKY for proper indications.

47. Repeat steps 43 and 44 except observe Row 2 of the DSKY for proper indications.

48. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

49. Repeat step 42 except observe Row 3 of the DSKY for proper indications.

50. Repeat steps 43 and 44 except observe Row 3 of the DSKY for proper indications.

51. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00000 ENTR
d. VERB 57 ENTR
e. 00015 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12205
REV. J
INITIAL TDRR 29382

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp. (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		3.0		
13A	28 VDC STANDBY	VDC	27.8		29.8		
13B	28 VDC IMU Standby Bus	VDC	25.80		31.80		
16	Counter indication	counts	099968		100032		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12205
REV. J

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17	3200 cps 28V feed - back voltage	volts	28.04		29.16		
23	CLOCK SYNC pulses pulses Printout 1	cps	XXXX2399800		XXXX2400200		
	Printout 2	cps	XXXX2399800		XXXX2400200		
	Printout 3	cps	XXXX2399800		XXXX2400200		
	Printout 4	cps	XXXX2399800		XXXX2400200		
	Printout 5	cps	XXXX2399800		XXXX2400200		
	Printout 6	cps	XXXX2399800		XXXX2400200		
	Printout 7	cps	XXXX2399800		XXXX2400200		
	Printout 8	cps	XXXX2399800		XXXX2400200		
	Printout 9	cps	XXXX2399800		XXXX2400200		
26	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	µsec	0.25		0.75		
	Pulse Rise Time	µsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
27	+4 VDC CGC power supply	volts dc	+3.80		+4.20		
	Noise	vp-p	0.0		0.4		
28	+14 VDC CGC power supply	volts dc	+13.6		+14.4		
	Noise	vp-p	0.0		0.4		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12205
REV. ___

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	No Fail Alarms	▨	▨		▨		
36	Fail Alarms	▨	▨		▨		
1, 2 3, 4 8, 9 10, 15 19, 40 41, 42 43, 44 45, 46 47, 48 49, 50	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) $\times \frac{0.02V}{MM} \times \frac{2^\circ}{V} = +(\pm)$ ____ . ____ °	b
	MEAN PIPA TEMP (line a + line b) ____ . ____ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12205
REV. J

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) $\times \frac{0.02V}{MM} \times \frac{2^\circ}{V} = +(\pm)$ ____ . ____ °	e
	MEAN IRIG TEMP (line d + line f) ____ . ____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ____ . ____ °	
	Line c ____ . ____ °	
	Temp Difference (absolute) ____ . ____ °	

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JOB STANDBY CONTROL TEST

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INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS
C	11-10-66	31885	1,2,4,5	-	EA	-
D	11-15-66	31939	1	-	EA	-
E	1-12-67	32619	1,2,3,5	1,2	EA	-
F	3-9-67	33186	5	-	EA	-
G	5-4-67	33717	-	2	EA	-
H	6-6-67	33903	5	2	EA	-
J	7-20-67	34176	1	1	SB	-
K	1-26-68	35513	All	All	EA	-

REFERENCES PS 2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Perform the following DSKY operations:

a. VERB 66 ENTR

b. Press and hold PRO (or STBY) pushbutton until STBY indicator lights.

Observe NO ATT and TEMP indicators are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC

2. IRIG Standby Temperature deviation CHANNEL 4-3DC

b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 0.20 v/cm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."

2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G&N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

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14. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

15. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

16. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

17. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

18. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 19 if Auxiliary Calibration System is to be used.

19. Insure that the AGC Calibration System has been calibrated within the past seven days.

20. Insure that the CGC power has been on for at least two hours before proceeding.

21. Set Frequency Counter controls as follows:

FUNCTION switch to FREQ
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

22. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

23. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel.

24. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directed in CPS. Count output frequency for 15 minutes and record data from the printout.

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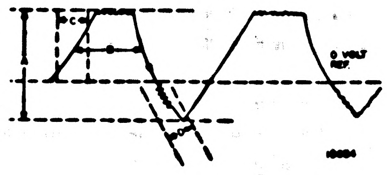
25. Disconnect cable W259 (2014470-011) P1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

26. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

27. Measure and record the following characteristics on the Computer Test Set Oscilloscope:



a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise

28. Perform the following DSKY and CTS operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out.
b. Press RSET pushbutton.
c. VERB 61 ENTR
d. VERB 36 ENTR
e. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

+4 VDC CGC POWER SUPPLY

29. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC CGC Power Supply voltage indicated on DVM. Use Dual Beam Oscilloscope to measure the noise present on 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

30. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC CGC Power Supply voltage indicated on DVM. Use Dual Beam Oscilloscope to measure noise present on 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

31. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

32. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

33. Set VOLTAGE SELECT switch to AGC (+4V) +3V and adjust CONTROL 1 for 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

34. Set VOLTAGE SELECT switch to AGC (+14V) +13V and adjust CONTROL 2 for 14.0 (±0.40) vdc.

35. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. 77767 ENTR

36. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +14 VDC CGC Power Supply voltage on DVM.

37. Use CONTROL 1 to adjust +4 VDC CGC Power Supply voltage to 3.40 vdc. Use CONTROL 2 to adjust +14 VDC CGC Power Supply voltage to 12.1 vdc and to 16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

CGC VOLTAGE FAIL ALARM LIMITS

38. Use CONTROL 1 to set +4 VDC CGC Power Supply voltage to 4.0 (±0.20) vdc. Use CONTROL 2 to set +14 VDC CGC Power Supply voltage to 14.0 (±0.40) vdc.

39. Press to extinguish INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

NOTE: Fail indications in the step below occur only with MAIN DSKY installed for test or with cable W160 (P3) connected to the DSKY.

40. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc
b. 4.6 vdc and 14.0 vdc
c. 4.0 vdc and 16.4 vdc
d. 4.0 vdc and 12.2 vdc

41. Set CONTROL 1 and CONTROL 2 switches to OFF.

42. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. +00000 ENTR

BMAG ATTITUDE SIGNALS

43. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00200 ENTR
d. VERB 25 NOUN 01 ENTR
e. 00042 ENTR

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f. 77777 ENTR
g. 77777 ENTR
h. 77777 ENTR
i. VERB 15 NOUN 01 ENTR
j. 00042 ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

44. Press the SINGLE PULSE switch on the XY Interface panel. The SINGLE PULSE lamp shall light.

45. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

46. Press the SINGLE PULSE pushbutton. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE pushbutton waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

47. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

48. Actuate the SINGLE PULSE pushbutton as indicated in step 46. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

49. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall to out.

50. Repeat step 46 except observe Row 2 of the DSKY for proper indications.

51. Repeat steps 47 and 48 except observe Row 2 of the DSKY for proper indications.

52. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

53. Repeat step 46 except observe Row 3 of the DSKY for proper indications.

54. Repeat steps 47 and 48 except observe Row 3 of the DSKY for proper indications.

55. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 25 NOUN 01 ENTR
c. 00042 ENTR
d. 00000 ENTR
e. 00000 ENTR
f. 00000 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12205
REV. K
INITIAL TDRR 29882

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp· (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		3.0		
13	28 VDC STANDBY	VDC	27.8		29.8		
14	28 VDC IMU Standby Bus	VDC	25.80		31.80		
17	Counter indication	counts	099968		100032		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12205
REV K

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18	3200 cps 28V feed - back voltage	volts	28.04		29.16		
24	CLOCK SYNC pulses pulses Printout 1	cps	XXXX2399800		XXXX2400200		
	Printout 2	cps	XXXX2399800		XXXX2400200		
	Printout 3	cps	XXXX2399800		XXXX2400200		
	Printout 4	cps	XXXX2399800		XXXX2400200		
	Printout 5	cps	XXXX2399800		XXXX2400200		
	Printout 6	cps	XXXX2399800		XXXX2400200		
	Printout 7	cps	XXXX2399800		XXXX2400200		
	Printout 8	cps	XXXX2399800		XXXX2400200		
	Printout 9	cps	XXXX2399800		XXXX2400200		
27	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	µsec	0.25		0.75		
	Pulse Rise Time	µsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
29	+4 VDC CGC power supply	volts dc	+3.80		+4.20		
	Noise	vp-p	0.0		0.4		
30	+14 VDC CGC power supply	volts dc	+13.6		+14.4		
	Noise	vp-p	0.0		0.4		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12205
REV. K

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
37	No Fail Alarms	▨	▨		▨		
40	Fail Alarms	▨	▨		▨		
1, 2 3, 4 8, 9 10, 16 20, 44 45, 46 47, 48 49, 50 51, 52 53, 54	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) $\times(\quad)\frac{V}{MM}\times\frac{2^\circ}{V} = +(\pm)$ ____ . ____ °	b
	MEAN PIPA TEMP (line a + line b) ____ . ____ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12205
REV. K

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) $\times(\quad)\frac{V}{MM}\times\frac{2^\circ}{V} = +(\pm)$ ____ . ____ °	e
	MEAN IRIG TEMP (line d + line f) ____ . ____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ____ . ____ °	
	Line c ____ . ____ °	
	Temp Difference (absolute) ____ . ____ °	

DATE 30 JUN 66

JOB STANDBY CONTROL TEST | JDC 12205 REV. L PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS
C	11-10-66	31885	1,2,4,5	-	EA	-
D	11-15-66	31939	1	-	EA	-
E	1-12-67	32619	1,2,3,5	1,2	EA	-
F	3-9-67	33186	5	-	EA	-
G	5-4-67	33717	-	2	EA	-
H	6-6-67	33903	5	2	EA	-
J	7-20-67	34176	1	1	SB	-
K	1-26-68	35513	All	All	EA	-
L	3-19-68	35888	1,4-6	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light. Reset all existing alarms on CTS and DSKY.

3. Perform the following DSKY operations:

a. VERB 60 ENTR

b. Press and hold PRO (or STBY) pushbutton until STBY indicator lights. Observe NO ATT and TEMP indicators are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC

2. IRIG Standby Temperature deviation CHANNEL 4-3DC

b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 0.20 v/cm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."

2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G&N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

---

14. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

15. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

16. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

17. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

18. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 19 if Auxiliary Calibration System is to be used.

19. Insure that the AGC Calibration System has been calibrated within the past seven days.

20. Insure that the CGC power has been on for at least two hours before proceeding.

21. Set Frequency Counter controls as follows:

FUNCTION switch to FREQ
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

22. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

23. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel.

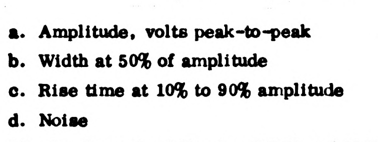
24. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directed in CPS. Count output frequency for 15 minutes and record data from the printout.

---

25. Disconnect cable W259 (2014470-011) P1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

26. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

27. Measure and record the following characteristics on the Computer Test Set Oscilloscope:



a. Amplitude, volts peak-to-peak

b. Width at 50% of amplitude

c. Rise time at 10% to 90% amplitude

d. Noise

28. Perform the following DSKY and CTS operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out.

b. Press RSET pushbutton.

c. VERB 61 ENTR

d. VERB 36 ENTR

e. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

+4 VDC CGC POWER SUPPLY

NOTE: Set DVM switch on Primary Signal Selector panel to OFF when measuring noise on Dual Beam Oscilloscope in steps 29 and 30.

29. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC CGC Power Supply voltage indicated on DVM. Use Dual Beam Oscilloscope to measure the noise present on 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

30. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC CGC Power Supply voltage indicated on DVM. Use Dual Beam Oscilloscope to measure noise present on 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

31. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

32. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

33. Set VOLTAGE SELECT switch to AGC (+4V) +3V and adjust CONTROL 1 for 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

34. Set VOLTAGE SELECT switch to AGC (+14V) +13V and adjust CONTROL 2 for 14.0 (±0.40) vdc.

35. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. 77767 ENTR

36. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC CGC Power Supply voltage on DVM.

37. Use CONTROL 1 to adjust +4 VDC CGC Power Supply voltage to 3.40 vdc. Use CONTROL 2 to adjust +14 VDC CGC Power Supply voltage to 12.1 vdc and to 16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

CGC VOLTAGE FAIL ALARM LIMITS

38. Use CONTROL 1 to set +4 VDC CGC Power Supply voltage to 4.0 (±0.20) vdc. Use CONTROL 2 to set +14 VDC CGC Power Supply voltage to 14.0 (±0.40) vdc.

39. Press to extinguish INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

NOTE: Fail indications in the step below occur only with MAIN DSKY installed for test or with cable W160 (P3) connected to the DSKY.

40. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc
b. 4.6 vdc and 14.0 vdc
c. 4.0 vdc and 16.4 vdc
d. 4.0 vdc and 12.2 vdc

41. Set CONTROL 1 and CONTROL 2 switches to OFF.

42. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. +00000 ENTR

BMAG ATTITUDE SIGNALS

43. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00200 ENTR
d. VERB 25 NOUN 01 ENTR
e. 00042 ENTR

---

f. 77777 ENTR
g. 77777 ENTR
h. 77777 ENTR
i. VERB 15 NOUN 01 ENTR
j. 00042 ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

44. Press the SINGLE PULSE switch on the XY Interface panel. The SINGLE PULSE lamp shall light.

45. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

46. Press the SINGLE PULSE pushbutton. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE pushbutton waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

47. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

48. Actuate the SINGLE PULSE pushbutton as indicated in step 46. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

49. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall to out.

50. Repeat step 46 except observe Row 2 of the DSKY for proper indications.

51. Repeat steps 47 and 48 except observe Row 2 of the DSKY for proper indications.

52. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

53. Repeat step 46 except observe Row 3 of the DSKY for proper indications.

54. Repeat steps 47 and 48 except observe Row 3 of the DSKY for proper indications.

55. Perform the following DSKY operations:

a. VERB 36 ENTR
b. KEY REL indicator will flash; press KEY REL pushbutton.
c. VERB 25 NOUN 01 ENTR
d. 00042 ENTR
e. 00000 ENTR
f. 00000 ENTR
g. 00000 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12205
REV. L
INITIAL TDRR 29882

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		3.0		
13	28 VDC STANDBY	VDC	27.8		29.8		
14	28 VDC IMU Standby Bus	VDC	25.80		31.80		
17	Counter indication	counts	099968		100032		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12205
REV I

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18	3200 cps 28V feed - back voltage	volts	28.04		29.16		
24	CLOCK SYNC pulses pulses Printout 1	cps	XXXX2399800		XXXX2400200		
	Printout 2	cps	XXXX2399800		XXXX2400200		
	Printout 3	cps	XXXX2399800		XXXX2400200		
	Printout 4	cps	XXXX2399800		XXXX2400200		
	Printout 5	cps	XXXX2399800		XXXX2400200		
	Printout 6	cps	XXXX2399800		XXXX2400200		
	Printout 7	cps	XXXX2399800		XXXX2400200		
	Printout 8	cps	XXXX2399800		XXXX2400200		
	Printout 9	cps	XXXX2399800		XXXX2400200		
27	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	µsec	0.25		0.75		
	Pulse Rise Time	µsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
29	+4 VDC CGC power supply	volts dc	+3.80		+4.20		
	Noise	vp-p	0.0		0.4		
30	+14 VDC CGC power supply	volts dc	+13.6		+14.4		
	Noise	vp-p	0.0		0.4		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12205
REV. I

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
37	No Fail Alarms	▨	▨		▨		
40	Fail Alarms	▨	▨		▨		
1,2 3,4 8,9 10,16 20,44 45,46 47,48 49,50 51,52 53,54	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) $x(\ )\frac{V}{MM} x \frac{2^\circ}{V} = +(\pm)$ ____.____ °	b
	MEAN PIPA TEMP (line a + line b) ____.____ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12205
REV. I

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) $x(\ )\frac{V}{MM} x \frac{2^\circ}{V} = +(\pm)$ ____.____ °	e
	MEAN IRIG TEMP (line d + line f) ____.____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ____.____ °	
	Line c ____.____ °	
	Temp Difference (absolute) ____.____ °	

DATE 30 JUN 66

JDC 12205 REV. M PAGE 1 OF 7

JOB STANDBY CONTROL TEST

INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS
C	11-10-66	31885	1,2,4,5	-	EA	-
D	11-15-66	31939	1	-	EA	-
E	1-12-67	32619	1,2,3,5	1,2	EA	-
F	3-9-67	33186	5	-	EA	-
G	5-4-67	33717	-	2	EA	-
H	6-6-67	33903	5	2	EA	-
J	7-20-67	34176	1	1	SB	-
K	1-26-68	35513	All	All	EA	-
L	3-19-68	35888	1,4-6	-	EA	-
M	3-18-69	37428	1 - 5	4	EA	-

REFERENCES PS 2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

NOTE: If the VERB display on the DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC operate power is applied.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light. Reset all existing alarms on CTS and DSKY. AGC ALARMS lamp 6 on Logic Drawer No. 1 shall remain lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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3. Perform the following DSKY operations:

a. VERB 60 ENTR

b. Press and hold PRO (or STBY) pushbutton until STBY indicator lights. Observe NO ATT and TEMP indicators are lighted.

c. Verify that ALARMS lamp 6 on Logic Drawer No. 1 goes out and ALARMS lamp 4 lights.

d. Verify that GOJAM, STPIT, LINC, and INHIBIT INTERRUPT lamps on Logic Drawer No. 2 are lighted and that COMPUTER STANDBY lamp on Monitor panel is lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC

2. IRIG Standby Temperature deviation CHANNEL 4-3DC

b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 0.20 v/cm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."

2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

---

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G&N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

14. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

15. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

16. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

17. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

18. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 19 if Auxiliary Calibration System is to be used.

19. Insure that JDC 04830 has been performed within the past seven days.

20. Insure that the CGC power has been on for at least two hours before proceeding.

21. Set Frequency Counter controls as follows:

FUNCTION switch to FREQ
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

22. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

---

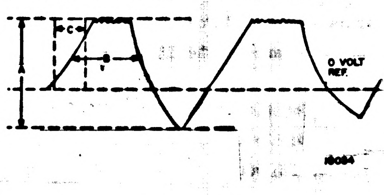
23. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel.

24. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directed in CPS. Count output frequency for 15 minutes and record data from the printout.

25. Disconnect cable W259 (2014470-011) P1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

26. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

27. Measure and record the following characteristics on the Computer Test Set Oscilloscope:



a. Amplitude, volts peak-to-peak

b. Width at 50% of amplitude

c. Rise time at 10% to 90% amplitude

d. Noise shall be defined as any nonsynchronous spikes or ripple riding on the pulse.

28. Perform the following DSKY and CTS operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out. If STBY indicator does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the system log the number of times pressed.

b. Press RSET pushbutton.

c. VERB 61 ENTR

d. VERB 36 ENTR

e. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

f. Verify that ALARMS lamp 6 on Logic Drawer No. 1 lights and ALARMS lamp 4 goes out.

g. Verify that COMPUTER STANDBY lamp on Monitor panel goes out.

+4 VDC CGC POWER SUPPLY

NOTE: Set DVM switch on Primary Signal Selector panel to OFF when measuring noise on Dual Beam Oscilloscope in steps 29 and 30.

29. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC CGC Power Supply voltage indicated on DVM. Use Dual Beam Oscilloscope to measure the noise present on 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

30. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC CGC Power Supply voltage indicated on DVM. Use Dual Beam Oscilloscope to measure noise present on 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

31. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

32. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

33. Set VOLTAGE SELECT switch to AGC (+4V) +3V and adjust CONTROL 1 for 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

34. Set VOLTAGE SELECT switch to AGC (+14V) +13V and adjust CONTROL 2 for 14.0 (±0.40) vdc.

35. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. 77767 ENTR

36. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC CGC Power Supply voltage on DVM.

37. Use CONTROL 1 to adjust +4 VDC CGC Power Supply voltage to 3.40 vdc. Use CONTROL 2 to adjust +14 VDC CGC Power Supply voltage to 12.1 vdc and to 16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

CGC VOLTAGE FAIL ALARM LIMITS

38. Use CONTROL 1 to set +4 VDC CGC Power Supply voltage to 4.0 (±0.20) vdc. Use CONTROL 2 to set +14 VDC CGC Power Supply voltage to 14.0 (±0.40) vdc.

39. Press to extinguish INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

NOTE: Fail indications in the step below occur only with MAIN DSKY installed for test or with cable W160 (P3) connected to the DSKY.

40. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc
b. 4.6 vdc and 14.0 vdc
c. 4.0 vdc and 16.4 vdc
d. 4.0 vdc and 12.2 vdc

40A. Monitor CGC/LGC WARNING NO. 1 lamp on the Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified below. No computer failures shall occur:

a. 4.0 vdc and 15.6 vdc
b. 4.0 vdc and 12.8 vdc
c. 3.8 vdc and 14.0 vdc
d. 4.2 vdc and 14.0 vdc

41. Set CONTROL 1 and CONTROL 2 switches to OFF.

42. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. +00000 ENTR

BMAG ATTITUDE SIGNALS

43. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00200 ENTR
d. VERB 25 NOUN 01 ENTR
e. 00042 ENTR
f. 77777 ENTR
g. 77777 ENTR
h. 77777 ENTR
i. VERB 15 NOUN 01 ENTR
j. 00042 ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

44. Press the SINGLE PULSE switch on the XY Interface panel. The SINGLE PULSE lamp shall light.

45. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

46. Press the SINGLE PULSE pushbutton. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE pushbutton waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

47. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

---

48. Actuate the SINGLE PULSE pushbutton as indicated in step 46. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

49. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall to out.

50. Repeat step 46 except observe Row 2 of the DSKY for proper indications.

51. Repeat steps 47 and 48 except observe Row 2 of the DSKY for proper indications.

52. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

53. Repeat step 46 except observe Row 3 of the DSKY for proper indications.

54. Repeat steps 47 and 48 except observe Row 3 of the DSKY for proper indications.

55. Perform the following DSKY operations:

a. VERB 36 ENTR
b. KEY REL indicator will flash; press KEY REL pushbutton.
c. VERB 25 NOUN 01 ENTR
d. 00042 ENTR
e. 00000 ENTR
f. 00000 ENTR
g. 00000 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12205
REV. M
INITIAL TDRR 29882

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		3.0		
13	28 VDC STANDBY	VDC	27.8		29.8		
14	28 VDC IMU Standby Bus	VDC	25.80		31.80		
17	Counter indication	counts	099968		100032		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 4

JDC
NO. 12205
REV. M

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18	3200 cps 28V feed - back voltage	volts	28.04		29.16		
24	CLOCK SYNC pulses pulses Printout 1	cps	XXXX2399800		XXXX2400200		
	Printout 2	cps	XXXX2399800		XXXX2400200		
	Printout 3	cps	XXXX2399800		XXXX2400200		
	Printout 4	cps	XXXX2399800		XXXX2400200		
	Printout 5	cps	XXXX2399800		XXXX2400200		
	Printout 6	cps	XXXX2399800		XXXX2400200		
	Printout 7	cps	XXXX2399800		XXXX2400200		
	Printout 8	cps	XXXX2399800		XXXX2400200		
	Printout 9	cps	XXXX2399800		XXXX2400200		
27	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
29	+4 VDC CGC power supply	volts dc	+3.80		+4.20		
	Noise	vp-p	0.0		0.4		
30	+14 VDC CGC power supply	volts dc	+13.6		+14.4		
	Noise	vp-p	0.0		0.4		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 4

JDC
NO. 12205
REV. M

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
37	No Fail Alarms	▨	▨		▨		
40	Fail Alarms	▨	▨		▨		
1,2 3,4 8,9 10,16 20,44 45,46 47,48 49,50 51,52 53,54	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) $\_\_\_ \times (\ \ )\frac{V}{MM} \times \frac{2^{\circ}}{V} = +(\pm)$ ___ . ___ °	b
	MEAN PIPA TEMP (line a + line b) ___ . ___ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 4

JDC
NO. 12205
REV. M

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) $\_\_\_ \times (\ \ )\frac{V}{MM} \times \frac{2^{\circ}}{V} = +(\pm)$ ___ . ___ °	e
	MEAN IRIG TEMP (line d + line e) ___ . ___ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ___ . ___ °	
	Line c ___ . ___ °	
	Temp Difference (absolute) ___ . ___ °	

DATE 30 JUN 66

JOB STANDBY CONTROL TEST
JDC 12205 REV. N PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30275	All	All	EA	MB
B	7-28-66	30301	1,3	-	EA	WS
C	11-10-66	31885	1,2,4,5	-	EA	-
D	11-15-66	31939	1	-	EA	-
E	1-12-67	32619	1,2,3,5	1,2	EA	-
F	3-9-67	331.6	5	-	EA	-
G	5-4-67	33717	-	2	EA	-
H	6-6-67	33903	5	2	EA	-
J	7-20-67	34176	1	1	SB	-
K	1-26-68	35513	All	All	EA	-
L	3-19-68	35888	1,4-6	-	EA	-
M	3-18-69	37428	1 - 5	4	EA BD	-
N	4-21-69	37529	2,5	-	EA JF	-

REFERENCES PS 2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

PROCEDURE

NOTE: If the VERB display on the DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC operate power is applied.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light. Reset all existing alarms on CTS and DSKY. AGC ALARMS lamp 6 on Logic Drawer No. 1 shall remain lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

3. Perform the following DSKY operations:

a. VERB 60 ENTR

b. Press and hold PRO (or STBY) pushbutton until STBY indicator lights. Observe NO ATT and TEMP indicators are lighted. Press ALARM RESET pushbutton on Programmer and Monitor panel.

c. Verify that ALARMS lamp 6 on Logic Drawer No. 1 goes out and ALARMS lamp 4 lights.

d. Verify that GOJAM, STPIT, LINC, and INHIBIT INTERRUPT lamps on Logic Drawer No. 2 are lighted and that COMPUTER STANDBY lamp on Monitor panel is lighted.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

6. Set up the oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3DC

2. IRIG Standby Temperature deviation CHANNEL 4-8DC

b. Insure that the CH 3DC and CH 4DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNEL 3 and 4 on the Oscillograph Amplifier setting the CHART SPEED to 1 and Range to 0.20 v/cm on the Oscillograph controls for CHANNELS 3 and 4.

d. Mark the Oscillograph channels as follows:

1. CHANNEL 3 "Start of Standby PIPA Temp test."

2. CHANNEL 4 "Start of Standby IRIG Temp test."

7. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

TEMPERATURE CONTROL

10. Observe the Monitor Panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

11. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

12. Determine from the Oscillograph Chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period and record the results. Calculate and record the differences between the mean IRIG and PIPA Temperatures.

28 VDC IMU STANDBY BUS

13. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G&N POWER ADJUST on the Test Control panel until the DVM indicates 28.8 (±1.0) VDC. Record indication.

14. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

(3200 SUSPENSION POWER)

15. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD

16. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

17. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The counter shall indicate approximately 100000. Record the Counter indication.

18. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 19 if Auxiliary Calibration System is to be used.

19. Insure that JDC 04830 has been performed within the past seven days.

20. Insure that the CGC power has been on for at least two hours before proceeding.

21. Set Frequency Counter controls as follows:

FUNCTION switch to FREQ
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER

22. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

23. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel.

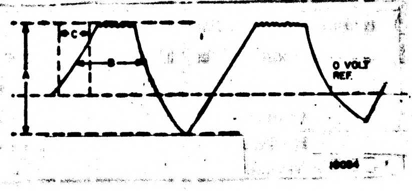
24. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directed in CPS. Count output frequency for 15 minutes and record data from the printout.

25. Disconnect cable W259 (2014470-011) P1 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS.

26. Connect a jumper from the CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS. Insure that no other jumpers are connected to the CLOCK connectors.

27. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10% to 90% amplitude
d. Noise shall be defined as any nonsynchronous spikes or ripple riding on the pulse.



28. Perform the following DSKY and CTS operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out. If STBY indicator does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the system log the number of times pressed.

b. Press RSET pushbutton.

c. VERB 61 ENTR

d. VERB 36 ENTR

e. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

f. Verify that ALARMS lamp 6 on Logic Drawer No. 1 lights and ALARMS lamp 4 goes out.

g. Verify that COMPUTER STANDBY lamp on Monitor panel goes out.

+4 VDC CGC POWER SUPPLY

NOTE: Set DVM switch on Primary Signal Selector panel to OFF when measuring noise on Dual Beam Oscilloscope in steps 29 and 30.

29. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC CGC Power Supply voltage indicated on DVM. Use Dual Beam Oscilloscope to measure the noise present on 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

30. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC CGC Power Supply voltage indicated on DVM. Use Dual Beam Oscilloscope to measure noise present on 14 volt supply voltage. Record indication.

CGC VOLTAGE MARGIN TEST

31. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

32. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

33. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor +4 VDC CGC power supply voltage on DVM. Adjust CONTROL 1 on Power Control panel until DVM indicates 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

34. Set CROSSBAR CONTROL on Primary Signal Selector panel to 293 to monitor +14 VDC CGC power supply voltage on DVM. Adjust CONTROL 2 on Power Control panel until DVM indicates 14.0 (±0.40) vdc.

35. Perform the following DSKY operations:

a. VERB 21	NOUN 27	ENTR
b. 77767		ENTR

36. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC CGC Power Supply voltage on DVM.

NOTE: During performance of steps 37 through 40A, set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC CGC power supply voltage on the DVM, and set CROSSBAR CONTROL to 293 to monitor the +14 VDC CGC power supply voltage on the DVM.

37. Use CONTROL 1 to adjust +4 VDC CGC Power Supply voltage to 3.40 vdc. Use CONTROL 2 to adjust +14 VDC CGC Power Supply voltage to 12.1 vdc and to 16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

CGC VOLTAGE FAIL ALARM LIMITS

38. Use CONTROL 1 to set +4 VDC CGC Power Supply voltage to 4.0 (±0.20) vdc. Use CONTROL 2 to set +14 VDC CGC Power Supply voltage to 14.0 (±0.40) vdc.

39. Press to extinguish INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

NOTE: Fail indications in the step below occur only with MAIN DSKY installed for test or with cable W160 (P3) connected to the DSKY.

40. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc
b. 4.6 vdc and 14.0 vdc
c. 4.0 vdc and 16.4 vdc
d. 4.0 vdc and 12.2 vdc

40A. Monitor CGC/LGC WARNING NO. 1 lamp on the Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified below. No computer failures shall occur:

a. 4.0 vdc and 15.6 vdc
b. 4.0 vdc and 12.8 vdc
c. 3.8 vdc and 14.0 vdc
d. 4.2 vdc and 14.0 vdc

41. Set CONTROL 1 and CONTROL 2 switches to OFF.

42. Perform the following DSKY operations:

a. VERB 21	NOUN 27	ENTR
b. +00000		ENTR

BMAG ATTITUDE SIGNALS

43. Perform the following DSKY operations:

a. VERB 21	NOUN 10	ENTR
b. 00013		ENTR
c. 00200		ENTR
d. VERB 25	NOUN 01	ENTR
e. 00042		ENTR
f. 77777		ENTR
g. 77777		ENTR
h. 77777		ENTR
i. VERB 15	NOUN 01	ENTR
j. 00042		ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of DSKY.

44. Press the SINGLE PULSE switch on the XY Interface panel. The SINGLE PULSE lamp shall light.

45. Set the AGC INPUT COUNTERS switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

46. Press the SINGLE PULSE pushbutton. After the COMP ACTY light on DSKY flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE pushbutton waiting until the COMP ACTY lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

47. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

48. Actuate the SINGLE PULSE pushbutton as indicated in step 46. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

49. Set the AGC INPUT COUNTERS switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

50. Repeat step 46 except observe Row 2 of the DSKY for proper indications.

51. Repeat steps 47 and 48 except observe Row 2 of the DSKY for proper indications.

52. Set the AGC INPUT COUNTERS switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

53. Repeat step 46 except observe Row 3 of the DSKY for proper indications.

54. Repeat steps 47 and 48 except observe Row 3 of the DSKY for proper indications.

55. Perform the following DSKY operations:

a. VERB 36 ENTR

b. KEY REL indicator will flash; press KEY REL pushbutton.

c. VERB 25	NOUN 01	ENTR
d. 00042		ENTR
e. 00000		ENTR
f. 00000		ENTR
g. 00000		ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12205
REV. N
INITIAL TDRR 29882

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	28 VDC STANDBY	VDC	27.8		29.8		
12	Mean PIPA Temp (one hour)	°F	129.0		132.0		
	Mean IRIG Temp. (one hour)	°F	▨		▨		
	Mean Temperature Difference (absolute)	°F	0.0		3.0		
13	28 VDC STANDBY	VDC	27.8		29.8		
14	28 VDC IMU Standby Bus	VDC	25.80		31.80		
17	Counter Indication	counts	099968		100032		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 4

JDC
NO. 12205
REV. N

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18	3200 cps 28V feed - back voltage	volts	28.04		29.16		
24	CLOCK SYNC pulses pulses Printout 1	cps	XXXX2399800		XXXX2400200		
	Printout 2	cps	XXXX2399800		XXXX2400200		
	Printout 3	cps	XXXX2399800		XXXX2400200		
	Printout 4	cps	XXXX2399800		XXXX2400200		
	Printout 5	cps	XXXX2399800		XXXX2400200		
	Printout 6	cps	XXXX2399800		XXXX2400200		
	Printout 7	cps	XXXX2399800		XXXX2400200		
	Printout 8	cps	XXXX2399800		XXXX2400200		
	Printout 9	cps	XXXX2399800		XXXX2400200		
27	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	µsec	0.25		0.75		
	Pulse Rise Time	µsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
29	+4 VDC CGC power supply	volts dc	+3.80		+4.20		
	Noise	vp-p	0.0		0.4		
30	+14 VDC CGC power supply	volts dc	+13.6		+14.4		
	Noise	vp-p	0.0		0.4		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 4

JDC
NO. 12205
REV. N

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
37	No Fail Alarms	▨	▨		▨		
40	Fail Alarms	▨	▨		▨		
1,2 3,4 8,9 10,16 20,44 45,46 47,48 49,50 51,52 53,54	Displays (Reacted as specified)						

JDC ITEM NO.	CALCULATIONS	
12	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (chart zero) 130.00 degrees	a
	Deviation of PIPA Mean (±) No. MM (Between PIPA Mean and Chart Zero) x ( ) $\frac{V}{MM} \times \frac{2^\circ}{V}$ = + (±) ____ . ____ °	b
	MEAN PIPA TEMP (line a + line b) ____ . ____ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of Mean	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 4

JDC
NO. 12205
REV. N

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS	
12 (cont)	Deviation of IRIG Mean (±) No. MM (Between IRIG Mean and Chart Zero) x ( ) $\frac{V}{MM} \times \frac{2^\circ}{V}$ = + (±) ____ . ____ °	e
	MEAN IRIG TEMP (line d + line e) ____ . ____ °	f
	Temp Difference = IRIG TEMP - PIPA TEMP = line f - line c	
	Line f ____ . ____ °	
	Line c ____ . ____ °	
	Temp Difference (absolute) ____ . ____ °	

DATE 30 JUN 66

FORM 00148
Chg. 7-23-65

JOB STANDBY CONTROL TEST

JDC 12205 REV. - PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES PS 2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

INITIALIZATION

1. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide power for DSKY illumination. The pushbuttons shall light.

3. Insure the STBY condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

a. VERB 60 ENTR

Press and hold the STBY pushbutton until the STBY lamp lights.

4. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

5. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

6. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

7. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBITED pushbuttons are not lighted.

8. Observe the Temperature Monitor Control panel to confirm that the failure lamps are not lighted.

9. Set the CROSSBAR CONTROL on the

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

JOB STANDBY CONTROL TEST

JDC 12205 REV - PAGE 2 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 28.0 (±0.5) vdc.

TEMPERATURE CONTROL

10. a. Set the CROSSBAR CONTROL to 156. Measure and record the instantaneous IRIG Temperature deviation voltage indicated on the DVM.

b. Set the CROSSBAR CONTROL to 255. Measure and record the instantaneous Accelerometer Temperature deviation voltage indicated on the DVM.

11. a. Repeat step 10.a one hour after performing it initially.

b. Repeat step 10.b one hour after performing it initially.

NOTE: Continue with the remaining steps during this one hour period.

12. Calculate the IRIG and Accelerometer Temperatures measured in steps 11.a and 11.b on the Calculation sheet.

28 VDC IMU STANDBY BUS

13. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 120. Measure and record the voltage indicated on the DVM.

3200 SUSPENSION POWER

14. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5

DISPLAY RESET to ZERO

CLOCK FREQUENCY DIVIDER to 10

CLOCK SELECTOR to INT

FUNCTION to OFF

INPUT SELECTOR to C SENSE

SENSE SELECTOR to FWD

TRIGGER VOLTAGE ATTN D to 10

TRIGGER VOLTAGE to fully counterclockwise

SAMPLE TIME (N_1) to 032000

FUNCTION to RATIO OR PERIOD

15. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

16. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

17. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123.

DATE ______

JOB STANDBY CONTROL TEST

JDC 12205 REV - PAGE 3 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

18. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

19. Insure that the CGC power has been on for at least two hours before proceeding.

20. Set the Frequency Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.

INPUT VOLTS RMS switch to 6.4

SLOPE switch to +

GATE switch to OPEN

TRIGGER LEVEL switch to CENTER

21. Set the FREQ-TIME switch on the Frequency Counter to the 100-second position (first setting from fully counterclockwise).

22. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interfaces panel of the Computer Calibration Equipment console.

23. Select an INPUT VOLTS RMS switch position on the CMC Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is On and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

24. Disconnect cable W259(2014470-011) P-6 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS. Connect the jumper cable from the AGC CLOCK (BNC) on the Systems Interface panel of the CTS to the adjacent CLOCK (BNC) on the Interface Signals patch board.

25. Connect a jumper from the remaining CLOCK connector on the Interface Signals patch board to either 1 MEG input channel of the Oscilloscope on the CTS.

26. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak

b. Width at 50% of amplitude

c. Rise time at 10% to 90% amplitude

d. Noise

+4 VDC CGC POWER SUPPLY

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 4 volt supply voltage. Record indication.

+14 VDC CGC POWER SUPPLY

28. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC CGC Power Supply voltage indicated on the DVM. Use the oscilloscope to measure the noise present on the 14 volt supply voltage. Record indication.

DATE ______

JOB STANDBY CONTROL TEST

JDC 12205 REV - PAGE 4 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

CGC VOLTAGE MARGIN TEST

29. Perform the following MAIN DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.

b.	RESET	Press
c.	VERB 61	ENTR
d.	VERB 36	ENTR

30. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

31. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON.

32. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set the CONTROL 1 switch to ON, and then readjust.

33. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.

34. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM.

35. Using CONTROL 1, slowly reduce the CGC 4 VDC supply voltage until the CMC lamp on the Indicator Control panel lights. The PGNS lamp on the Indicator Control panel, the RESTART lamp on the DSKY's and the CGC/LGC WARNING lamp and the G/N CAUTION lamp on the Monitor panel shall be lighted. Record the DVM indication.

36. Using CONTROL 1, adjust the +4 V supply to approximately 4 volts. Press the RSET pushbutton on the NAV DSKY. All alarms shall go out within 60 seconds.

37. Using CONTROL 1, slowly increase the CGC 4 CDC supply voltage until the CMC lamp on the Indicator Control panel lights. The PGNS lamp on the Indicator Control panel, the RESTART lamp on the DSKY's and the CGC/LGC WARNING lamp and the G/N CAUTION lamp on the Monitor panel shall be lighted. Record the DVM indication.

38. Using CONTROL 1, adjust the CGC 4 VDC supply to 4.00 (±0.15) vdc on the DVM. Press the RSET pushbutton on the NAV DSKY. All alarms shall go out within 60 seconds.

39. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293. Monitor the CGC 14 VDC voltage on the DVM.

DATE ______

40. Using CONTROL 2, slowly reduce the CGC 14 VDC supply voltage until the CMC lamp on the Indicator Control panel lights. The PGNS lamp on the Indicator Control panel, the RESTART lamp on the DSKY's and the CGC/LGC WARNING lamp and the G/N CAUTION lamp on the Monitor panel shall be lighted. Record the DVM indication.

41. Using CONTROL 2, adjust the CGC 14 VDC supply to approximately 14 volts. Press the RSET pushbutton on the NAV DSKY. All alarms shall go out within 60 seconds.

42. Using CONTROL 2, slowly increase the CGC 14 VDC supply until the CMC lamp on the Indicator Control panel lights. The PGNS lamp on the Indicator Control panel, the RESTART lamp on the DSKYs and the CGC/LGC WARNING lamp and the G/N CAUTION lamp on the Monitor panel shall be lighted. Record the DVM indication.

43. Use CONTROL 2, if necessary, to adjust the CGC 14 VDC voltage to 16.2 (±0.2) volts. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel and the RSET pushbutton on the NAV DSKY. All alarms shall go out within 60 seconds and the INHIBIT COMPUTER POWER FAIL lamp shall light.

44. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 to monitor the CGC 4 VDC supply.

45. Using CONTROL 1, slowly reduce the CGC 4 VDC voltage on the DVM to 3.6 (±0.05) volts. No alarms shall occur.

46. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 to monitor the CGC 14 VDC supply.

47. Using CONTROL 2, slowly reduce the CGC 14 VDC voltage on the DVM to 12.6 (±0.2) volts. No alarms shall occur.

48. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 to monitor the CGC 4 VDC supply.

49. Using CONTROL 1, slowly increase the CGC 4 VDC voltage on the DVM to 4.5 (±0.2) volts. No alarms shall occur.

50. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 to monitor the CGC 14 VDC supply.

51. Using CONTROL 2, slowly increase the CGC 14 VDC voltage to 16.2 (±0.2) volts. No alarms shall occur.

52. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 to monitor the CGC 4 VDC supply.

53. Using CONTROL 1, slowly decrease the CGC 4 VDC voltage on the DVM to 4.0 (±0.15) volts. No alarms shall occur.

54. Set the CROSSBAR CONTROL to 293 to monitor the CGC 14 VDC supply.

55. Using CONTROL 2, adjust the CGC 14 VDC voltage on the DVM to 14.0 (±0.2) volts.

DATE ________

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56. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel and the RSET pushbutton on the NAV DSKY. The INHIBIT COMPUTER POWER FAIL lamp shall go out.

57. Set the CONTROL 1 and CONTROL 2 switches on the Power Control panel to OFF.

58. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

BMAG ATTITUDE SIGNALS

59. Perform the following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00013		ENTR
c.	00200		ENTR
d.	VERB 25	NOUN 01	ENTR
e.	00042		ENTR
f.	77777		ENTR
g.	77777		ENTR
h.	77777		ENTR
i.	VERB 15	NOUN 01	ENTR
j.	00042		ENTR

Observe 77777 is displayed in Rows 1, 2, and 3 of both DSKY's.

60. Press the SINGLE PULSE pushbutton on the XY Interface panel. The pushbutton shall light.

61. Set the AGC INPUT COUNTER switch to position 6 and press the POSITIVE pushbutton. The pushbutton shall light.

62. Press the SINGLE PULSE switch. After the COMP ACTY light flashes on and off, the Row 1 display will have changed to 00001. Continue actuating the SINGLE PULSE switch waiting until the COMP ACT lamp flashes to allow the DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010, and 00011.

63. Press the POSITIVE and NEGATIVE pushbuttons. The NEGATIVE pushbutton shall light and the POSITIVE pushbutton shall go out.

64. Actuate the SINGLE PULSE pushbutton as indicated in step 62. Row 1 of the DSKY shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

65. Set the AGC INPUT COUNTER switch to position 7 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

66. Repeat step 62 except observe Row 2 of the DSKY for proper indications.

67. Repeat steps 63 and 64 except observe Row 2 of the DSKY for proper indications.

68. Set the AGC INPUT COUNTER switch to position 8 and press the POSITIVE and NEGATIVE pushbuttons. The POSITIVE pushbutton shall light and the NEGATIVE pushbutton shall go out.

69. Repeat step 62 except observe Row 3 of the DSKY for proper indications.

70. Repeat steps 63 and 64 except observe Row 3 of the DSKY for proper indications.

DATE ________

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71. Perform the following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00013		ENTR
c.	00000		ENTR

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5
JOB STANDBY CONTROL TEST

JDC NO. 12205
REV. -
INITIAL TDRR 29982

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ________	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ____ CAL DATE

NAME ________ SER. NO. ____ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10.a	IRIG Temperature Deviation Voltage	volts	-3.25		+4.0		
b	Accelerometer Temperature Deviation Voltage	volts	-2.5		+2.5		
11.a	IRIG Temperature Deviation Voltage (after one hour) -	volts	-3.25	( ) ________	+4.0		
b	Accelerometer Temperature Deviation Voltage (after one hour) =	volts	-0.5	( ) ________	+1.0		
12	Temp Difference (absolute)	°F	0.00		+2.00		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12205
REV. -

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	28 VDC IMU Standby Bus	volts	27.50		28.50		
16	Counter indication	counts	099968		100032		
17	3200 cps 28V feed - back voltage	volts	28.04		29.16		
23	CLOCK SYNC pulses pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	1023997		1024003		
	Printout 3	cps	1023997		1024003		
	Printout 4	cps	1023997		1024003		
	Printout 5	cps	1023997		1024003		
	Printout 6	cps	1023997		1024003		
	Printout 7	cps	1023997		1024003		
	Printout 8	cps	1023997		1024003		
	Printout 9	cps	1023997		1024003		
26	Pulse Amplitude	vp-p	4.0		14.0		
	Pulse Width	µsec	0.25		0.75		
	Pulse Rise Time	µsec	▨		0.2		
	Pulse Noise	mvp-p	▨		200		
27	+4 VDC CGC power supply	volts dc	+3.85		+4.15		
	Noise	vp-p	0.0		0.4		
28	+14 VDC CGC power supply	volts dc	+13.8		+14.2		
	Noise	vp-p	0.0		0.4		

DATE ______

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EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12205
REV. -

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	4V Low Margin	volts	3.55		3.65		
36	RESTART lamp G/N CAUTION lamp CGC/LGC WARNING lamp CMC lamp PGNS lamp	▨	go out		▨		
37	4V High Margin	volts	4.3		4.7		
38	RESTART lamp G/N CAUTION lamp CGC/LGC WARNING lamp CMC lamp PGNS lamp	▨	go out		▨		
40	14V Low Margin	volts	12.4		12.8		
41	RESTART lamp G/N CAUTION lamp CGC/LGC WARNING lamp CMC lamp PGNS lamp	▨	go out		▨		
42	14V High Margin	volts	16.0		16.4		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12205
REV. -

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
43	RESTART lamp G/N CAUTION lamp CGC/LGC WARNING lamp CMC lamp PGNS lamp	▨	go out		▨		
45	No Fail Alarms	▨	▨		▨		
47	No Fail Alarms	▨	▨		▨		
49	No Fail Alarms	▨	▨		▨		
51	No Fail Alarms	▨	▨		▨		
53	No Fail Alarms	▨	▨		▨		
1, 2 3, 4 5, 6 7, 8 9, 15 19, 36 38, 41 43, 55 60, 61 62, 63 64, 65 66, 67 68, 69 70	Displays (Reacted as specified)						

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12205
REV. -

JOB STANDBY CONTROL TEST

JDC ITEM NO.	CALCULATIONS		
12	IRIG TEMP = Nominal IRIG TEMP + Deviation		
	Nominal IRIG TEMP	135.000 degrees	(a)
	Deviation (Step 11.a x 2 deg/volt)	+ ( ) ___ . ___	(b)
	IRIG TEMP (Line a + Line b)	___ . ___ degrees	(c)
	PIPA TEMP = Nominal PIPA Temp + Deviation		
	Nominal PIPA TEMP	130.000 degrees	(d)
	Deviation (Step 11.b x 2 deg/volt)	+ ( ) ___ . ___	(e)
	PIPA TEMP (line d + Line e)	___ . ___ degrees	(f)

DATE ______

JOB G & N SYSTEM OPERATIONAL TEST
JDC 12206 REV. A PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

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A	7-28-66	30302	3, 5	1	EA	WS

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

MAIN DSKY CHECK

NOTE: Insure step 2 through 18 operations are performed on the MAIN DSKY.

2. Perform the following MAIN DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM OPERATION TEST
JDC 12206 REV A PAGE 2 OF 6
SUBSYSTEM G & N SYSTEM
ASSY

b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3
l. VERB-NOUN Flashing

on concurrently for 5 seconds

m. Plus signs in Row 1, Row 2 and Row 3
n. VERB-NOUN Flashing

on concurrently for 5 seconds

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following MAIN DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing

on concurrently for 5 seconds

k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2 and Row 3

on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the MAIN DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following MAIN DSKY operations:

a. VERB 57 ENTR

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JOB G & N SYSTEM OPERATIONAL TEST
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SUBSYSTEM G & N SYSTEM
ASSY

b. 0015 ENTR
c. Observe
DSKY blanks
d. VERB 21 NOUN 02 ENTR
e. Observe
VERB 21 NOUN 02 Flashing
f. 01600 ENTR
g. Observe
VERB 21 NOUN 02 Flashing
h. 33777
i. VERB 25 NOUN 26 ENTR
j. Observe
VERB 21 NOUN 26 Flashing
k. 04000 ENTR
l. Observe
VERB 22 NOUN 26 Flashing
m. 01600 ENTR
n. Observe
VERB 23 NOUN 26 Flashing
o. 00003 ENTR
p. VERB 30 ENTR

9. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

10. Press the RESET pushbutton on the MAIN DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe
VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

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JOB G & N SYSTEM OPERATIONAL TEST
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SUBSYSTEM G & N SYSTEM
ASSY

12. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

TC TRAP TEST

14. Perform the following MAIN DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe
VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe
VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe
VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe
VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR

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m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART conditon lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

19. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NAV DSKY CHECK

20. Repeat steps 2 through 19 for the NAV DSKY.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications. (During the 15 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500, and 04500 respectively and no program alarms shall occur.)

---

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

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EQUIPMENT TEST
DATA SHEET 1 OF 2

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JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE

NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
29	Horizontal earth rate (R2) .	ERU	See Table 1		See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (27)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
33 (29)	Horizontal earth	ERU	See Table 1		See Table 1			f
	Self Test Failures	▨	▨		▨			

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EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. A

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (27)	gravity	cm/sec^2	975.0	R1 ______ R1 ______	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line b - line e = j = ______ line c - line f = k = ______ line b - line h = l = ______ line c - line i = m = ______

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. B PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

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A	7-28-66	30302	3, 5	1	EA	WS
B	9-1-66	30923	5	-	JP	

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

MAIN DSKY CHECK

NOTE: Insure step 2 through 18 operations are performed on the MAIN DSKY.

2. Perform the following MAIN DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's

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SUBSYSTEM G & N SYSTEM | ASSY

b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3
l. VERB-NOUN Flashing
} on concurrently for 5 seconds

m. Plus signs in Row 1, Row 2 and Row 3
n. VERB-NOUN Flashing
} on concurrently for 5 seconds

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following MAIN DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
} on concurrently for 5 seconds

k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2 and Row 3
} on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the MAIN DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following MAIN DSKY operations:

a. VERB 57 ENTR

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SUBSYSTEM G & N SYSTEM | ASSY

b. 0015 ENTR
c. Observe
DSKY blanks
d. VERB 21 NOUN 02 ENTR
e. Observe
VERB 21 NOUN 02 Flashing
f. 01600 ENTR
g. Observe
VERB 21 NOUN 02 Flashing
h. 33777
i. VERB 25 NOUN 26 ENTR
j. Observe
VERB 21 NOUN 26 Flashing
k. 04000 ENTR
l. Observe
VERB 22 NOUN 26 Flashing
m. 01600 ENTR
n. Observe
VERB 23 NOUN 26 Flashing
o. 00003 ENTR
p. VERB 30 ENTR

9. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

10. Press the RESET pushbutton on the MAIN DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe
VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV B PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

12. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

TC TRAP TEST

14. Perform the following MAIN DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe
VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe
VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe
VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe
VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR

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m. Observe

VERB 23	NOUN 26	Flashing

n. 00003 ENTR

o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

> NOTE: After completion of step 19, the MAIN DSKY may be removed from the system configuration if desired. In this event, down-mode the system to OFF according to procedure in JDC 12204. Remove MAIN DSKY and up-mode the system according to procedure in section A of JDC 12204.

19. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NAV DSKY CHECK

20. Repeat steps 2 through 19 for the NAV DSKY.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:

a.	VERB 21	NOUN 27	ENTR
b.	Observe		
	VERB 21	NOUN 27	Flashing
c.	77767		ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	Observe		
	VERB 21	NOUN 01	Flashing
c.	00004		ENTR
d.	Observe		
	VERB 16	NOUN 20	Displayed

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications. (During the 15 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500, and 04500 respectively and no program alarms shall occur.)

---

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12206
REV. B
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (27)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
33 (29)	Horizontal earth	ERU	See Table 1		See Table 1			f
	Self Test Failures	▨	▨		▨			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. B

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (27)	gravity	cm/sec^2	975.0	R1 ______ R1 ______	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line b - line e = j = ______ line c - line f = k = ______ line b - line h = l = ______ line c - line i = m = ______

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. C PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS. 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

MAIN DSKY CHECK

NOTE: Insure step 2 through 18 operations are performed on the MAIN DSKY.

2. Perform the following MAIN DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM OPERATION TEST | JDC 12206 REV C PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3 } on concurrently for 5 seconds
l. VERB-NOUN Flashing }
m. Plus signs in Row 1, Row 2 and Row 3 } on concurrently for 5 seconds
n. VERB-NOUN Flashing }

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following MAIN DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY } on concurrently for 5 seconds
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing } on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2 and Row 3

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the MAIN DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following MAIN DSKY operations:

a. VERB 57 ENTR

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV C PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

b. 0015 ENTR
c. Observe
DSKY blanks
d. VERB 21 NOUN 02 ENTR
e. Observe
VERB 21 NOUN 02 Flashing
f. 01600 ENTR
g. Observe
VERB 21 NOUN 02 Flashing
h. 33777
i. VERB 25 NOUN 26 ENTR
j. Observe
VERB 21 NOUN 26 Flashing
k. 04000 ENTR
l. Observe
VERB 22 NOUN 26 Flashing
m. 01600 ENTR
n. Observe
VERB 23 NOUN 26 Flashing
o. 00003 ENTR
p. VERB 30 ENTR

9. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

10. Press the RESET pushbutton on the MAIN DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe
VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV C PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

12. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

TC TRAP TEST

14. Perform the following MAIN DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe
VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe
VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe
VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe
VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR

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m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

NOTE: After completion of step 19, the MAIN DSKY may be removed from the system configuration if desired. In this event, down-mode the system to OFF according to procedure in JDC 12204. Remove MAIN DSKY and up-mode the system according to procedure in section A of JDC 12204.

19. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Press ALARM RESET pushbutton on the P & M drawer of CTS.

NAV DSKY CHECK

20. Repeat steps 2 through 19 for the NAV DSKY.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications. (During the 15 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500, and 04500 respectively and no program alarms shall occur.)

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28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, −0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, −0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12206
REV. C
INITIAL TDRR 29382

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION ______
TIME ______ START ______ END ______ TOTAL ELAPSED ______

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec²	975.0	R1 ______ R2 ______	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (27)	gravity	cm/sec²	975.0	R1 ______ R2 ______	985.9			e
33 (29)	Horizontal earth	ERU	See Table 1		See Table 1			f
	Self Test Failures	▨	▨		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV C

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (27)	gravity	cm/sec²	975.0	R1 ______ R1 ______	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec²	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec²	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line b - line e = j = ______ line c - line f = k = ______ line b - line h = l = ______ line c - line i = m = ______

DATE 30 JUN 66

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. D PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS. 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

MAIN DSKY CHECK

NOTE: Insure step 2 through 18 operations are performed on the MAIN DSKY.

2. Perform the following MAIN DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM OPERATION TEST | JDC 12206 REV D PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3
l. VERB-NOUN Flashing
} on concurrently for 5 seconds

m. Plus signs in Row 1, Row 2 and Row 3
n. VERB-NOUN Flashing
} on concurrently for 5 seconds

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following MAIN DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2 and Row 3
} on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the MAIN DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following MAIN DSKY operations:

a. VERB 57 ENTR

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SUBSYSTEM G & N SYSTEM | ASSY

b. 0015 ENTR
c. Observe
DSKY blanks
d. VERB 21 NOUN 02 ENTR
e. Observe
VERB 21 NOUN 02 Flashing
f. 01600 ENTR
g. Observe
VERB 21 NOUN 02 Flashing
h. 33777
i. VERB 25 NOUN 26 ENTR
j. Observe
VERB 21 NOUN 26 Flashing
k. 04000 ENTR
l. Observe
VERB 22 NOUN 26 Flashing
m. 01600 ENTR
n. Observe
VERB 23 NOUN 26 Flashing
o. 00003 ENTR
p. VERB 30 ENTR

9. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

10. Press the RESET pushbutton on the MAIN DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe
VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

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SUBSYSTEM G & N SYSTEM | ASSY

12. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

TC TRAP TEST

14. Perform the following MAIN DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe
VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe
VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe
VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe
VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR

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m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

> NOTE: After completion of step 19, the MAIN DSKY may be removed from the system configuration if desired. In this event, down-mode the system to OFF according to procedure in JDC 12204. Remove MAIN DSKY and up-mode the system according to procedure in section A of JDC 12204.

19. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Press ALARM RESET pushbutton on the P & M drawer of CTS.

NAV DSKY CHECK

20. Repeat steps 2 through 19 for the NAV DSKY.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications. (During the 15 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500, and 04500 respectively and no program alarms shall occur.)

---

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12206
REV. D
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (27)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
33 (29)	Horizontal earth	ERU	See Table 1		See Table 1			f
	Self Test Failures	▨	▨		▨			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. D

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (27)	gravity	cm/sec^2	975.0	R1 ______ R1 ______	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δ gravity (low bus)	cm/sec^2	-1		+1			j
	Δ horizontal earth rate (low bus)	meru	-25		+25			k
	Δ gravity (high bus)	cm/sec^2	-1		+1			l
	Δ horizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line b - line e = j = ______ line c - line f = k = ______ line b - line h = l = ______ line c - line i = m = ______

JOB G & N SYSTEM OPERATIONAL TEST

JDC 12206 REV. E PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

MAIN DSKY CHECK

NOTE: Insure step 2 through 18 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 18 are satisfactorily completed with one DSKY.

2. Perform the following MAIN DSKY operations:

VERB 21	NOUN 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

- a. 9's
- b. 8's
- c. 7's
- d. 6's
- e. 5's
- f. 4's
- g. 3's
- h. 2's
- i. 1's
- j. 0's
- k. Minus signs in Row 1, Row 2 and Row 3
- l. VERB-NOUN Flashing

} on concurrently for 5 seconds

- m. Plus signs in Row 1, Row 2 and Row 3
- n. VERB-NOUN Flashing

} on concurrently for 5 seconds

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following MAIN DSKY displays shall illuminate for 5 seconds.

- a. UPLINK ACTY
- b. NO ATT (Momentarily on)
- c. STBY
- d. KEY REL Flashing
- e. TEMP
- f. GIMBAL LOCK
- g. PROG
- h. RESTART
- i. TRACKER
- j. OPR ERROR Flashing

} on concurrently for 5 seconds

- k. VERB-NOUN Flashing
- l. PGNS, CMC and ISS lamps on Indicator Control panel
- m. Plus 88888 in Row 1, Row 2 and Row 3

} on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe		
VERB 24	NOUN 01	Flashing
c. 01700		ENTR
d. Observe		
VERB 21	NOUN 01	Flashing
e. +12345		ENTR
f. Observe		
VERB 22	NOUN 01	Flashing
g. -67890	Do NOT press	ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the MAIN DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following MAIN DSKY operations:

a. VERB 57	ENTR

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b. 0015		ENTR
c. Observe DSKY blanks		
d. VERB 21	NOUN 02	ENTR
e. Observe		
VERB 21	NOUN 02	Flashing
f. 01600		ENTR
g. Observe		
VERB 21	NOUN 02	Flashing
h. 33777		
i. VERB 25	NOUN 26	ENTR
j. Observe		
VERB 21	NOUN 26	Flashing
k. 04000		ENTR
l. Observe		
VERB 22	NOUN 26	Flashing
m. 01600		ENTR
n. Observe		
VERB 23	NOUN 26	Flashing
o. 00003		ENTR
p. VERB 30		ENTR

9. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

10. Press the RESET pushbutton on the MAIN DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe		
VERB 21	NOUN 26	Flashing
j. 00001		ENTR
k. Observe		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe		
VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 31		ENTR

DATE 30 JUN 66

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12. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

TC TRAP TEST

14. Perform the following MAIN DSKY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe		
VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. Observe		
VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe		
VERB 21	NOUN 26	Flashing
h. 04000		ENTR
i. Observe		
VERB 22	NOUN 26	Flashing
j. 01600		ENTR
k. Observe		
VERB 23	NOUN 26	Flashing
l. 00003		ENTR
m. VERB 30		ENTR

15. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe		
VERB 21	NOUN 26	Flashing
j. 34000		ENTR
k. Observe		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR

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m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

NOTE: After completion of step 19, the MAIN DSKY may be removed from the system configuration if desired, but only if the NAV DSKY remains for remainder of the test. In this event, down-mode the system to OFF according to procedure in JDC 12204. Remove MAIN DSKY and up-mode the system according to procedure in section A of JDC 12204.

19. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Press ALARM RESET pushbutton on the P & M drawer of CTS.

NAV DSKY CHECK

NOTE: Disregard step 20 if only one DSKY is used in system under test.

20. Repeat steps 2 through 19 for the NAV DSKY.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed

The NO ATT lamp shall light momentarily then go out.

---

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications. (During the 15 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500, and 04500 respectively and no program alarms shall occur.)

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12206
REV. E
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ________ DWG ________ REV. ________

TEST HISTORY
DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ________ CAL DATE
NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (27)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
33 (29)	Horizontal earth	ERU	See Table 1		See Table 1			f
	Self Test Failures	▨	▨		▨			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. E

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (27)	gravity	cm/sec^2	975.0	R1 ______ R1 ______	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line b - line e = j = ________ line c - line f = k = ________ line b - line h = l = ________ line c - line i = m = ________

JDC 12206 REV. F PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 2

JOB G & N SYSTEM OPERATIONAL TEST

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

MAIN DSKY CHECK

NOTE: Insure step 2 through 18 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 18 are satisfactorily completed with one DSKY.

2. Perform the following MAIN DSKY operations:

VERB 21	NOUN 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

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lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3
l. VERB-NOUN Flashing } on concurrently for 5 seconds
m. Plus signs in Row 1, Row 2 and Row 3
n. VERB-NOUN Flashing } on concurrently for 5 seconds

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following MAIN DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing } on concurrently for 5 seconds

k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel } on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)
m. Plus 88888 in Row 1, Row 2 and Row 3

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following MAIN DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe		
	VERB 24	NOUN 01	Flashing
c.	01700		ENTR
d.	Observe		
	VERB 21	NOUN 01	Flashing
e.	+12345		ENTR
f.	Observe		
	VERB 22	NOUN 01	Flashing
g.	-67890	Do NOT press	ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the MAIN DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following MAIN DSKY operations:

a.	VERB 57		ENTR

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b.	0015		ENTR
c.	Observe		
	DSKY blanks		
d.	VERB 21	NOUN 02	ENTR
e.	Observe		
	VERB 21	NOUN 02	Flashing
f.	01600		ENTR
g.	Observe		
	VERB 21	NOUN 02	Flashing
h.	33777		ENTR
i.	VERB 25	NOUN 26	ENTR
j.	Observe		
	VERB 21	NOUN 26	Flashing
k.	04000		ENTR
l.	Observe		
	VERB 22	NOUN 26	Flashing
m.	01600		ENTR
n.	Observe		
	VERB 23	NOUN 26	Flashing
o.	00003		ENTR
p.	VERB 30		ENTR

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified in steps 12, 15, and 18.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified in steps 9, 10, 12, 15, and 18.

In order to verify all indications, change DSKY locations and repeat steps 9 through 18.

9. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

10. Press the RESET pushbutton on the MAIN DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following MAIN DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe		
	VERB 24	NOUN 01	Flashing
c.	01600		ENTR
d.	Observe		
	VERB 21	NOUN 01	Flashing
e.	30001		ENTR
f.	Observe		
	VERB 22	NOUN 01	Flashing
g.	01600		ENTR
h.	VERB 25	NOUN 26	ENTR

---

i.	Observe		
	VERB 21	NOUN 26	Flashing
j.	00001		ENTR
k.	Observe		
	VERB 22	NOUN 26	Flashing
l.	01600		ENTR
m.	Observe		
	VERB 23	NOUN 26	Flashing
n.	00003		ENTR
o.	VERB 31		ENTR

12. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

TC TRAP TEST

14. Perform the following MAIN DSKY operations:

a.	VERB 21	NOUN 02	ENTR
b.	Observe		
	VERB 21	NOUN 02	Flashing
c.	01600		ENTR
d.	Observe		
	VERB 21	NOUN 02	Flashing
e.	01600		ENTR
f.	VERB 25	NOUN 26	ENTR
g.	Observe		
	VERB 21	NOUN 26	Flashing
h.	04000		ENTR
i.	Observe		
	VERB 22	NOUN 26	Flashing
j.	01600		ENTR
k.	Observe		
	VERB 23	NOUN 26	Flashing
l.	00003		ENTR
m.	VERB 30		ENTR

15. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe		
	VERB 24	NOUN 01	Flashing
c.	01600		ENTR
d.	Observe		
	VERB 21	NOUN 01	Flashing
e.	30001		ENTR
f.	Observe		
	VERB 22	NOUN 01	Flashing
g.	01600		ENTR
h.	VERB 25	NOUN 26	ENTR

i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

NOTE: After completion of step 19, the MAIN DSKY may be removed from the system configuration if desired, but only if the NAV DSKY remains for remainder of the test. In this event, down-mode the system to OFF according to procedure in JDC 12204. Remove MAIN DSKY and up-mode the system according to procedure in section A of JDC 12204.

19. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Press ALARM RESET pushbutton on the P & M drawer of CTS.

NAV DSKY CHECK

NOTE: Disregard step 20 if only one DSKY is used in system under test.

20. Repeat steps 2 through 19 for the NAV DSKY.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR

---

b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications. (During the 15 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500, and 04500 respectively and no program alarms shall occur.)

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12206
REV. F
INITIAL TDRR 29832

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 — — — — — — R2 — — — — — —	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (24)	Self Test Failures	▨	▨		▨			
33 (27)	gravity	cm/sec^2	975.0	R1 — — — — — — R2 — — — — — —	985.9			e
33 (29)	Horizontal earth	ERU	See Table 1		See Table 1			f
	Self Test Failures	▨	▨		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. F

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (24)	Self Test Failures	▨	▨		▨			
37 (27)	gravity	cm/sec^2	975.0	R1 — — — — — — R1 — — — — — —	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line b - line e = j = ______ line c - line f = k = ______ line b - line h = l = ______ line c - line i = m = ______

DATE 30 JUN 66

JOB G & N SYSTEM OPERATIONAL TEST | **JDC** 12206 **REV.** G **PAGE** 1 **OF** 6 | **INITIAL TDRR** 29882 **D.S. PGS** 2

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

MAIN DSKY CHECK

NOTE: Insure step 2 through 18 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 18 are satisfactorily completed with one DSKY.

2. Perform the following MAIN DSKY operations:

VERB 21	NOUN 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3 } on concurrently for 5 seconds
l. VERB-NOUN Flashing }
m. Plus signs in Row 1, Row 2 and Row 3 } on concurrently for 5 seconds
n. VERB-NOUN Flashing }

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following MAIN DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY } on concurrently for 5 seconds
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing } on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2 and Row 3

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR	
b. Observe			
VERB 24	NOUN 01	Flashing	
c. 01700		ENTR	
d. Observe			
VERB 21	NOUN 01	Flashing	
e. +12345		ENTR	
f. Observe			
VERB 22	NOUN 01	Flashing	
g. -67890		Do NOT press	ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the MAIN DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following MAIN DSKY operations:

a. VERB 57	ENTR

---

b. 00015		ENTR
c. Observe		
DSKY blanks		
d. VERB 21	NOUN 02	ENTR
e. Observe		
VERB 21	NOUN 02	Flashing
f. 01600		ENTR
g. Observe		
VERB 21	NOUN 02	Flashing
h. 33777		ENTR
i. VERB 25	NOUN 26	ENTR
j. Observe		
VERB 21	NOUN 26	Flashing
k. 04000		ENTR
l. Observe		
VERB 22	NOUN 26	Flashing
m. 01600		ENTR
n. Observe		
VERB 23	NOUN 26	Flashing
o. 00003		ENTR
p. VERB 30		ENTR

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified in steps 12, 15, and 18.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified in steps 9, 10, 12, 15, and 18.

In order to verify all indications, change DSKY locations and repeat steps 9 through 18.

9. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

10. Press the RESET pushbutton on the MAIN DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR

---

i. Observe		
VERB 21	NOUN 26	Flashing
j. 00001		ENTR
k. Observe		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe		
VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 31		ENTR

12. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

TC TRAP TEST

14. Perform the following MAIN DSKY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe		
VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. Observe		
VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe		
VERB 21	NOUN 26	Flashing
h. 04000		ENTR
i. Observe		
VERB 22	NOUN 26	Flashing
j. 01600		ENTR
k. Observe		
VERB 23	NOUN 26	Flashing
l. 00003		ENTR
m. VERB 30		ENTR

15. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR

JOB G & N SYSTEM OPERATIONAL TEST | **JDC** 12206 **REV.** G **PAGE** 1 **OF** 6
INITIAL TDRR 29882 **D.S. PGS** 2

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

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A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

MAIN DSKY CHECK

NOTE: Insure step 2 through 18 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 18 are satisfactorily completed with one DSKY.

2. Perform the following MAIN DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3
l. VERB-NOUN Flashing
} on concurrently for 5 seconds

m. Plus signs in Row 1, Row 2 and Row 3
n. VERB-NOUN Flashing
} on concurrently for 5 seconds

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following MAIN DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2 and Row 3
} on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the MAIN DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following MAIN DSKY operations:

a. VERB 57 ENTR

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b. 00015 ENTR
c. Observe
DSKY blanks
d. VERB 21 NOUN 02 ENTR
e. Observe
VERB 21 NOUN 02 Flashing
f. 01600 ENTR
g. Observe
VERB 21 NOUN 02 Flashing
h. 33777 ENTR
i. VERB 25 NOUN 26 ENTR
j. Observe
VERB 21 NOUN 26 Flashing
k. 04000 ENTR
l. Observe
VERB 22 NOUN 26 Flashing
m. 01600 ENTR
n. Observe
VERB 23 NOUN 26 Flashing
o. 00003 ENTR
p. VERB 30 ENTR

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified in steps 12, 15, and 18.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified in steps 9, 10, 12, 15, and 18.

In order to verify all indications, change DSKY locations and repeat steps 9 through 18.

9. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

10. Press the RESET pushbutton on the MAIN DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR

---

i. Observe
VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

12. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

TC TRAP TEST

14. Perform the following MAIN DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe
VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe
VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe
VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe
VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR

i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

NOTE: After completion of step 19, the MAIN DSKY may be removed from the system configuration if desired, but only if the NAV DSKY remains for remainder of the test. In this event, down-mode the system to OFF according to procedure in JDC 12204. Remove MAIN DSKY and up-mode the system according to procedure in section A of JDC 12204.

19. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Press ALARM RESET pushbutton on the P & M drawer of CTS.

NAV DSKY CHECK

NOTE: Disregard step 20 if only one DSKY is used in system under test.

20. Repeat steps 2 through 19 for the NAV DSKY.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR

---

b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed
e. VERB 34 ENTR

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12206
REV. G
INITIAL TDRR 29982

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (24)	Self Test Failures	▨	▨		▨			
33 (27)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
33 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			f
	Self Test Failures	▨	▨		▨			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. G

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (24)	Self Test Failures	▨	▨		▨			
37 (27)	gravity	cm/sec^2	975.0	R1 ______ R1 ______	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line b - line e = j = ______ line c - line f = k = ______ line b - line h = l = ______ line c - line i = m = ______

i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

NOTE: After completion of step 19, the MAIN DSKY may be removed from the system configuration if desired, but only if the NAV DSKY remains for remainder of the test. In this event, down-mode the system to OFF according to procedure in JDC 12204. Remove MAIN DSKY and up-mode the system according to procedure in section A of JDC 12204.

19. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Press ALARM RESET pushbutton on the P & M drawer of CTS.

NAV DSKY CHECK

NOTE: Disregard step 20 if only one DSKY is used in system under test.

20. Repeat steps 2 through 19 for the NAV DSKY.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR

---

b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed
e. VERB 34 ENTR

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12206
REV. G
INITIAL TDRR 29832

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (24)	Self Test Failures	▨	▨		▨			
33 (27)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
33 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			f
	Self Test Failures	▨	▨		▨			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. G

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (24)	Self Test Failures	▨	▨		▨			
37 (27)	gravity	cm/sec^2	975.0	R1 ______ R1 ______	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line b - line e = j = ______ line c - line f = k = ______ line b - line h = l = ______ line c - line i = m = ______

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. H PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-
H	3-9-67	33188	1-5	All	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: Insure steps 2 through 19 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 19 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 19 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Perform the following DSKY operations:
VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3
l. VERB-NOUN Flashing
} on concurrently for 5 seconds
m. Plus signs in Row 1, Row 2 and Row 3
n. VERB-NOUN Flashing
} on concurrently for 5 seconds

4. Enter VERB 35 and press the ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
} on concurrently for 5 seconds

k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2 and Row 3
} on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:
a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following DSKY operations:
a. VERB 57 ENTR

---

b. 00015 ENTR
c. Observe
DSKY blanks
d. VERB 21 NOUN 02 ENTR
e. Observe
VERB 21 NOUN 02 Flashing
f. 01600 ENTR
g. Observe
VERB 21 NOUN 02 Flashing
h. 33777 ENTR
i. VERB 25 NOUN 26 ENTR
j. Observe
VERB 21 NOUN 26 Flashing
k. 04000 ENTR
l. Observe
VERB 22 NOUN 26 Flashing
m. 01600 ENTR
n. Observe
VERB 23 NOUN 26 Flashing
o. 00003 ENTR
p. VERB 30 ENTR

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified in steps 9, 10, 12, 15, and 18.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified in steps 9, 10, 12, 15, and 18.

In order to verify all indications, change DSKY locations and repeat steps 8 through 19.

9. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY.

10. Press the RESET pushbutton on the DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following DSKY operations:
a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR

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i. Observe
VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

12. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:
a. VERB 21 NOUN 02 ENTR
b. Observe
VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe
VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe
VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe
VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following DSKY operations:
a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR

i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

19. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY. Press ALARM RESET pushbutton on the P & M drawer of CTS.

SECOND DSKY CHECK

NOTE: Disregard step 20 if only one DSKY is used in system under test.

20. Repeat steps 2 through 19 for the second DSKY.

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 20 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

---

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed
e. VERB 34 ENTR

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

---

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12206
REV. H
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 — — — — — — R2 — — — — — —	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1	0. — — — — — — —	See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (24)	Self Test Failures	▨	▨		▨			
33 (27)	gravity	cm/sec^2	975.0	R1 — — — — — — R2 — — — — — —	985.9			e
33 (29)	Horizontal earth rate (R2)	ERU	See Table 1	0. — — — — — —	See Table 1			f
	Self Test Failures	▨	▨		▨			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. H

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (24)	Self Test Failures	▨	▨		▨			
37 (27)	gravity	cm/sec^2	975.0	R1 _ _ _ _ _ R1 _ _ _ _ _	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1	0. _ _ _ _ _	See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line j = line b - line e = ____________ line k = line c - line f x 10^3 = ____________ line l = line b - line h = ____________ line m = line c - line i x 10^3 = ____________

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. J PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	7-28-66	30302	3,5	1	EA	WS	
B	9-1-66	30923	5	-	JP	-	
C	9-1-66	30930	5,6	-	JP	-	IMPORTANT See below.
D	10-20-66	31613	1	-	EA	-	
E	10-27-66	31724	1,5	-	EA	-	
F	11-15-66	31940	3	All	EA	-	INTERVAL
G	2-2-67	32880	3,6	1	EA	-	
H	3-9-67	33188	1-5	All	EA	-	TOOLS AND MATERIAL
J	7-20-67	34177	1	-	SB	-	

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: Insure steps 2 through 19 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 19 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 19 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV J PAGE 2 OF 7

SUBSYSTEM G & N SYSTEM | ASSY

lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3 } on concurrently for 5 seconds
l. VERB-NOUN Flashing
m. Plus signs in Row 1, Row 2 and Row 3 } on concurrently for 5 seconds
n. VERB-NOUN Flashing

4. Enter VERB 35 and press the ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
} on concurrently for 5 seconds
k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2 and Row 3
} on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 57 ENTR

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV J PAGE 3 OF 7

SUBSYSTEM G & N SYSTEM | ASSY

b. 00015 ENTR
c. Observe
DSKY blanks
d. VERB 21 NOUN 02 ENTR
e. Observe
VERB 21 NOUN 02 Flashing
f. 01600 ENTR
g. Observe
VERB 21 NOUN 02 Flashing
h. 33777 ENTR
i. VERB 25 NOUN 26 ENTR
j. Observe
VERB 21 NOUN 26 Flashing
k. 04000 ENTR
l. Observe
VERB 22 NOUN 26 Flashing
m. 01600 ENTR
n. Observe
VERB 23 NOUN 26 Flashing
o. 00003 ENTR
p. VERB 30 ENTR

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified in steps 9, 10, 12, 15, and 18.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified in steps 9, 10, 12, 15, and 18.

In order to verify all indications, change DSKY locations and repeat steps 8 through 19.

9. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY.

10. Press the RESET pushbutton on the DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV J PAGE 4 OF 7

SUBSYSTEM G & N SYSTEM | ASSY

i. Observe
VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

12. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe
VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe
VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe
VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe
VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR

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i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

19. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY. Press ALARM RESET pushbutton on the P & M drawer of CTS.

SECOND DSKY CHECK

NOTE: Disregard step 20 if only one DSKY is used in system under test.

20. Repeat steps 2 through 19 for the second DSKY.

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 20 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

---

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed
e. VERB 34 ENTR

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

---

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12206
REV. J
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 —————— R2 ——————	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1	0. ——————→	See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (24)	Self Test Failures	▨	▨		▨			
33 (27)	gravity	cm/sec^2	975.0	R1 —————— R2 ——————	985.9			e
33 (29)	Horizontal earth rate (R2)	ERU	See Table 1	0. ——————	See Table 1			f
	Self Test Failures	▨	▨		▨			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. J

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (24)	Self Test Failures	▨	▨		▨			
37 (27)	gravity	cm/sec^2	975.0	R1 — — — — — R1 — — — — —	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1	0. — — — — —	See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δ gravity (low bus)	cm/sec^2	-1		+1			j
	Δ horizontal earth rate (low bus)	meru	-25		+25			k
	Δ gravity (high bus)	cm/sec^2	-1		+1			l
	Δ horizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line j = line b - line e = __________ line k = line c - line f x 10^3 = __________ line l = line b - line h = __________ line m = line c - line i x 10^3 = __________

DATE 30 JUN 66

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. K PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS. 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-
H	3-9-67	33188	1-5	All	EA	-
J	7-20-67	34177	1	-	SB	-
K	11-9-67	35022	3,6,7	2	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: Insure steps 2 through 19 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 19 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 19 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Perform the following DSKY operations:

VERB 21	NOUN 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3
l. VERB-NOUN Flashing
} on concurrently for 5 seconds

m. Plus signs in Row 1, Row 2 and Row 3
n. VERB-NOUN Flashing
} on concurrently for 5 seconds

4. Enter VERB 35 and press the ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
} on concurrently for 5 seconds

k. VERB-NOUN Flashing } on concurrently for 5 seconds
l. PGNS, CMC and ISS lamps on Indicator Control panel } (CMC remains on approx. 60 seconds after other lamps go out)
m. Plus 88888 in Row 1, Row 2 and Row 3

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe		
	VERB 24	NOUN 01	Flashing
c.	01700		ENTR
d.	Observe		
	VERB 21	NOUN 01	Flashing
e.	+12345		ENTR
f.	Observe		
	VERB 22	NOUN 01	Flashing
g.	-67890	Do NOT press	ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following DSKY operations:

a.	VERB 57		ENTR

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b.	00015		ENTR
c.	Observe		
	DSKY blanks		
d.	VERB 27	NOUN 01	ENTR
e.	Observe		
	VERB 21	NOUN 01	Flashing
f.	70000		ENTR

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified in steps 9, 10, 12, 15, and 18.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified in steps 9, 10, 12, 15, and 18.

In order to verify all indications, change DSKY locations and repeat steps 8 through 19.

9. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY.

10. Press the RESET pushbutton on the DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe		
	VERB 24	NOUN 01	Flashing
c.	01600		ENTR
d.	Observe		
	VERB 21	NOUN 01	Flashing
e.	30001		ENTR
f.	Observe		
	VERB 22	NOUN 01	Flashing
g.	01600		ENTR
h.	VERB 25	NOUN 26	ENTR

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i.	Observe		
	VERB 21	NOUN 26	Flashing
j.	00001		ENTR
k.	Observe		
	VERB 22	NOUN 26	Flashing
l.	01600		ENTR
m.	Observe		
	VERB 23	NOUN 26	Flashing
n.	00003		ENTR
o.	VERB 31		ENTR

12. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a.	VERB 21	NOUN 02	ENTR
b.	Observe		
	VERB 21	NOUN 02	Flashing
c.	01600		ENTR
d.	Observe		
	VERB 21	NOUN 02	Flashing
e.	01600		ENTR
f.	VERB 25	NOUN 26	ENTR
g.	Observe		
	VERB 21	NOUN 26	Flashing
h.	04000		ENTR
i.	Observe		
	VERB 22	NOUN 26	Flashing
j.	01600		ENTR
k.	Observe		
	VERB 23	NOUN 26	Flashing
l.	00003		ENTR
m.	VERB 30		ENTR

15. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe		
	VERB 24	NOUN 01	Flashing
c.	01600		ENTR
d.	Observe		
	VERB 21	NOUN 01	Flashing
e.	30001		ENTR
f.	Observe		
	VERB 22	NOUN 01	Flashing
g.	01600		ENTR
h.	VERB 25	NOUN 26	ENTR

i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

19. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY. Press ALARM RESET pushbutton on the P & M drawer of CTS.

SECOND DSKY CHECK

NOTE: Disregard step 20 if only one DSKY is used in system under test.

20. Repeat steps 2 through 19 for the second DSKY.

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 20 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

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23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed
e. VERB 34 ENTR

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Low Voltage)

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

PIPA AND IRIG TEST (High Voltage)

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0.0, -0.25) vdc. Record indication.

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

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38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12206
REV. K
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1	0. ________	See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (24)	Self Test Failures	▨	▨		▨			
33 (27)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
33 (29)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			f
	Self Test Failures	▨	▨		▨			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. K

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (24)	Self Test Failures	▨	▨		▨			
37 (27)	gravity	cm/sec^2	975.0	R1 ______ R1 ______	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line j = line b - line e = ______ line k = (line c - line f) x 10^3 = ______ line l = line b - line h = ______ line m = (line c - line i) x 10^3 = ______

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JDC 12206 REV. L PAGE 1 OF 7
JOB G & N SYSTEM OPERATIONAL TEST
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-
H	3-9-67	33188	1-5	All	EA	-
J	7-20-67	34177	1	-	SB	-
K	11-9-67	35022	3,6,7	2	EA	-
L	1-4-68	35353	2,3,6	All	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: Insure steps 2 through 19 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 19 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 19 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3
l. VERB-NOUN Flashing
} on concurrently for 5 seconds

m. Plus signs in Row 1, Row 2 and Row 3
n. VERB-NOUN Flashing
} on concurrently for 5 seconds

4. Enter VERB 35 and press the ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
} on concurrently for 5 seconds

k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2 and Row 3
} on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out)

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 36 ENTR

---

b. Observe
DSKY blanks except PROG indicates 00
c. VERB 27 NOUN 01 ENTR
d. Observe
VERB 27 NOUN 01 Flashing
e. 70000 ENTR

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified in steps 9, 10, 12, 15, and 18.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified in steps 9, 10, 12, 15, and 18.

In order to verify all indications, change DSKY locations and repeat steps 8 through 19.

9. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY.

10. Press the RESET pushbutton on the DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR

---

i. Observe
VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

12. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe
VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe
VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe
VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe
VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe
VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe
VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR

i. Observe
VERB 21 NOUN 26 Flashing
j. 34000 ENTR
k. Observe
VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe
VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

19. Press the RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY. Press ALARM RESET pushbutton on the P & M drawer of CTS.

SECOND DSKY CHECK

NOTE: Disregard step 20 if only one DSKY is used in system under test.

20. Repeat steps 2 through 19 for the second DSKY.

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 20 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

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23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:
a. VERB 21 NOUN 27 ENTR
b. Observe
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:
a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe
VERB 16 NOUN 20 Displayed
e. Observe NO ATT lamp lights momentarily then goes out
f. VERB 34 ENTR

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Low Voltage)

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0, -0.25) vdc. Record indication.

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

PIPA AND IRIG TEST (High Voltage)

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0.25, -0) vdc. Record indication.

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

---

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

NO. 12206 JDC
REV. L
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	28.50		29.10			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.55		25.8			d
33 (24)	Self Test Failures	▨	▨		▨			
33 (27)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
33 (29)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			f
	Self Test Failures	▨	▨		▨			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. L

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	31.8		32.05			g
37 (24)	Self Test Failures	▨	▨		▨			
37 (27)	gravity	cm/sec^2	975.0	R1 — — — — — R1 — — — — —	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1	0. — — — — —	See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line j = line b - line e = __________ line k = (line c - line f) x 10^3 = __________ line l = line b - line h = __________ line m = (line c - line f) x 10^3 = __________

DATE 30 JUN 66

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. N PAGE 1 OF 25
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC self check being performed concurrently.

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-
H	3-9-67	33188	1-5	All	EA	-
J	7-20-67	34177	1	-	SB	-
K	11-9-67	35022	3,6,7	2	EA	-
L	1-4-68	35353	2,3,6	All	EA	-
M	5-29-68	36278	All	All	EA	-
N	8-26-68	36714	7-10, 13	1,2	EA JF	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL JDC 12206 CTS UPLINK Tape, P/N 2901626-001

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM 0014?A
Chg. 1-1?-66

INITIALIZATION

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate Power is applied.

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: 1. Insure steps 2 through 30 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 30 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 30 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 115.

3. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1	- RUPT LOC	
ALARMS #2	- CTR FAIL	
ALARMS #3	- TC TRAP	
ALARMS #4	- OSCILLATOR FAIL	
ALARMS #5	- NIGHT-WATCHMAN	
ALARMS #6	- PIPA FAIL	
ALARMS #7	- VOLTAGE FAIL	
ALARMS #8	- SCALER FAIL	
ALARMS #9	- WARNING FILTER	
ALARMS #12	- DOUBLE SCALER	
ALARMS #15	- GOJAM	CTS P/N
ALARMS #16	- E-MEMORY PARITY FAIL	2014042-071 only

2. Perform following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 21	NOUN 27	ENTR
c.	00011		ENTR

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3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2, and Row 3
l. VERB-NOUN Flashing
m. COMP ACTY
(k through m: on concurrently for approx. 5 seconds)

n. Plus signs in Row 1, Row 2, and Row 3
o. VERB-NOUN Flashing
p. COMP ACTY
(n through p: on concurrently for approx. 5 seconds)

q. COMP ACTY ——— on for approx. 5 seconds, then DSKY blanks

NOTE: Insure that CONDITION LAMPS switch on Indicator Control panel is set to ON.

4. Enter VERB 35 and press ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds:

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEL REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
(b through j: on concurrently for approx. 5 seconds)

k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2, and Row 3
(k through m: on concurrently for approx. 5 seconds (CMC remains on 10 to 20 seconds after other lamps go out))

After indications a through l go out, plus 88888's shall remain on Row 1, Row 2, and Row 3.

DATE 30 JUN 66

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe:		
	VERB 24	NOUN 01	Flashing
c.	01700		ENTR
d.	Observe:		
	VERB 21	NOUN 01	Flashing
e.	+12345		ENTR
f.	Observe:		
	VERB 22	NOUN 01	Flashing
g.	-67890	Do NOT press ENTR	

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 NOUN 01 continue flashing.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedure in this JDC.

DATE 30 JUN 66

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

(B) Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(C) Logic Drawer No. 2 - Set AGREEMENT B digit-switches to X01X3070. Set AGREEMENT B switch to STOP.

(D) RDC Interface panel - Press to light CH33-10 pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on

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MANUAL LOAD PROCEDURES

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

(E) Tape Reader (cont) - Programmer and Monitor panel and press RSET pushbutton on DSKY.

(F) Programmer and Monitor panel - Press EXECUTE pushbutton.

(G) Verify that tape advances to beginning of first UPLINK code.

(H) Programmer and Monitor panel - Press EXECUTE pushbutton.

(I) Verify that AGREEMENT B lamp on Logic Drawer NO. 2 is not lighted.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that DSKY blanks except PROG indicates 00.

MANUAL LOAD PROCEDURES

j. 01000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR
n. Observe:

DSKY blanks except PROG indicates 00.

9. Enter VERB 27 NOUN 01 and press ENTR pushbutton on the DSKY.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Enter 70000 and press ENTR pushbutton on the DSKY.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press the RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Enter VERB 36 and press ENTR pushbutton on the DSKY. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

CTS UPLINK TAPE LOAD PROCEDURES

9. Press EXECUTE pushbutton on Programmer and Monitor panel.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

MANUAL LOAD PROCEDURES

RUPT LOCK

16. Perform following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 01600 ENTR
c. 00004 ENTR
d. 30007 ENTR
e. 01601 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01600 ENTR
i. 00003 ENTR
j. VERB 31 ENTR

Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Enter VERB 36 and press ENTR pushbutton on the DSKY.

19. Perform following DSKY operations:

a. VERB 21 NOUN 26 ENTR
b. 01000 ENTR
c. VERB 30 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

RUPT LOCK

16. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Press EXECUTE pushbutton on Programmer and Monitor panel.

19. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 06 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

22. Enter VERB 36 and press ENTR pushbutton on the DSKY.

TC TRAP TEST

23. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01600 ENTR
c. 01600 ENTR
d. VERB 30 ENTR

24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

CTS UPLINK TAPE LOAD PROCEDURES

20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

22. Press EXECUTE pushbutton on Programmer and Monitor panel.

TC TRAP TEST

23. Press EXECUTE pushbutton on Programmer and Monitor panel.

24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

MANUAL LOAD PROCEDURES

25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26. Enter VERB 36 and press ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

27. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. 01600 ENTR
c. 30001 ENTR
d. 01600 ENTR
e. VERB 30 ENTR

28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.

29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

30. Enter VERB 36 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26. Press EXECUTE pushbutton on Programmer and Monitor panel.

NIGHT WATCHMAN TEST

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.

29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

30. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

SECOND DSKY CHECK

NOTE: Disregard step 31 if only one DSKY is used in system under test.

31. Repeat steps 2 through 30 for the second DSKY.

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

CTS UPLINK TAPE LOAD PROCEDURES

SECOND DSKY CHECK

NOTE: Disregard step 31 if only one DSKY is used in system under test.

31. Repeat steps 2 through 30 for the second DSKY. Reload the UPLINK Tape in the Tape Reader at the beginning of the tape.

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

MANUAL LOAD PROCEDURES

T5/T6 RUPT TEST

32. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 31304 ENTR
d. NOUN 15 ENTR
e. 00006 ENTR ENTR
f. 05013 ENTR ENTR
g. 04511 ENTR ENTR
h. 40000 ENTR ENTR
i. 31312 ENTR ENTR
j. 54030 ENTR ENTR
k. 31313 ENTR ENTR
l. 54345 ENTR ENTR
m. 04353 ENTR ENTR
n. 36027 ENTR ENTR
o. 01314 ENTR ENTR
p. 04572 ENTR ENTR
q. 00011 ENTR ENTR
r. 01300 ENTR
s. VERB 25 NOUN 26 ENTR
t. 01000 ENTR
u. 01305 ENTR
v. 00002 ENTR
w. VERB 21 NOUN 01 ENTR
x. 00031 ENTR
y. 37777 ENTR
z. VERB 11 NOUN 01 ENTR
aa. 00031 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

T5/T6 RUPT TEST

32. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NOTE: DSKY key entries made during steps 32 through 39 may cause the KEY REL indicator to flash.	
33. Press to light MONITOR pushbutton on Programmer and Monitor panel. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.	33. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.
34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RG display does not indicate 34055.
35. Enter VERB 30 and press ENTR pushbutton on the DSKY.	35. Press EXECUTE pushbutton on Programmer and Monitor panel.
36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.	36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.
37. Perform following DSKY operations: a. VERB 36 ENTR b. VERB 21 NOUN 01 ENTR c. 00031 ENTR d. 40000 ENTR e. VERB 11 NOUN 01 ENTR f. 00031 ENTR	37. Press EXECUTE pushbutton on Programmer and Monitor panel.
38. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	38. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.
39. Enter VERB 30 and press ENTR pushbutton on the DSKY.	39. Press EXECUTE pushbutton on Programmer and Monitor panel.
40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates	40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
11; Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.	11; Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.
41. Enter VERB 36 and press ENTR pushbutton on the DSKY.	41. Press EXECUTE pushbutton on Programmer and Monitor panel.
RADAR RUPT TEST	RADAR RUPT TEST
42. Perform following DSKY operations: a. VERB 24 NOUN 01 ENTR b. 01303 ENTR c. 04353 ENTR d. 00010 ENTR e. VERB 22 NOUN 26 ENTR f. 01300 ENTR	42. Press EXECUTE pushbutton on Programmer and Monitor panel.
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.
44. Enter VERB 30 and press ENTR pushbutton on the DSKY.	44. Press EXECUTE pushbutton on Programmer and Monitor panel.
45. Verify that RZ display on Programmer and Monitor panel indicates 4046.	45. Verify that RG display indicates 34062.
T10 RUPT TEST	T10 RUPT TEST
46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.	46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.
47. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 04000 ENTR d. VERB 30 ENTR	47. Press EXECUTE pushbutton on Programmer and Monitor panel.
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.
51. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	51. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
52. Enter VERB 30 and press ENTR pushbutton on the DSKY.	52. Press EXECUTE pushbutton on Programmer and Monitor panel.
53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.
55. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	55. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
56. Enter VERB 30 and press ENTR pushbutton on the DSKY.	56. Press EXECUTE pushbutton on Programmer and Monitor panel.
57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.
59. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	59. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
60. Enter VERB 30 and press ENTR pushbutton on the DSKY.	60. Press EXECUTE pushbutton on Programmer and Monitor panel.
61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.
63. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	63. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
64. Enter VERB 30 and press ENTR pushbutton on the DSKY.	64. Press EXECUTE pushbutton on Programmer and Monitor panel.
65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.
67. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	67. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
68. Enter VERB 30 and press ENTR pushbutton on the DSKY.	68. Press EXECUTE pushbutton on Programmer and Monitor panel.
69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.
71. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	71. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
72. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	72. Press EXECUTE pushbutton on Programmer and Monitor panel.
73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.
75. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	75. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
76. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	76. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.
79. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	79. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
80. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	80. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.
83. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	83. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
84. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	84. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.
87. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	87. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
88. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	88. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.
91. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	91. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
92. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	92. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC interface panel.	94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.
95. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
96. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	96. Press EXECUTE pushbutton on Programmer and Monitor panel.
97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display indicates 0.	97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and monitor panel does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
101. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	101. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude	104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude

MANUAL LOAD PROCEDURES

Impulse Hand Controller in the Right position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.

105. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.

107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.

CTS UPLINK TAPE LOAD PROCEDURES

Impulse Hand Controller in the Right position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.

105. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.

107. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.

MANUAL LOAD PROCEDURES

109. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

110. Enter VERB 36 and press ENTR pushbutton on DSKY.

IRIG AND PIPA TEST INITIALIZATION

111. Press ISS OPERATE pushbutton on Test Control panel.

112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.

CGC SELF CHECK

114. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. Observe:
VERB 21 NOUN 27 Flashing
c. 00010 ENTR

Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.

CTS UPLINK TAPE LOAD PROCEDURES

109. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

110. Press EXECUTE pushbutton on Programmer and Monitor panel.

IRIG AND PIPA TEST INITIALIZATION

111. Press ISS OPERATE pushbutton on Test Control panel.

112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.

CGC SELF CHECK

114. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and monitor panel.

114A. When VERB 21 NOUN 27 flashes on the DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.

MANUAL LOAD PROCEDURES

IRIG AND PIPA TEST (Nominal Voltage)

115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.

116. Perform following DSKY operations:

a. VERB 57 ENTR
b. Observe:
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe:
VERB 16 NOUN 20 Displayed
e. Observe:
NO ATT lamp lights momentarily
and then goes out
f. VERB 34 ENTR

117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.

118. Enter VERB 33 and press ENTR pushbutton on the DSKY.

119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.

CTS UPLINK TAPE LOAD PROCEDURES

IRIG AND PIPA TEST (Nominal Voltage)

115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.

116. Press EXECUTE pushbutton on Programmer and Monitor panel.

116A. When VERB 21 NOUN 01 flashes on the DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

116B. When VERB 16 NOUN 20 is displayed on the DSKY, observe that the NO ATT lamp lights momentarily and then goes out.

116C. Press EXECUTE pushbutton on Programmer and Monitor panel.

117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.

118. Press EXECUTE pushbutton on Programmer and Monitor panel.

119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.

MANUAL LOAD PROCEDURES

IRIG AND PIPA TEST (Low Voltage)

120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

122. Enter VERB 36 and press ENTR pushbutton on the DSKY.

123. Repeat steps 114 through 119.

IRIG AND PIPA TEST (High Voltage)

124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, -0.25) vdc. Record indication.

126. Enter VERB 36 and press ENTR pushbutton on the DSKY.

127. Repeat steps 114 through 119.

128. Enter VERB 36 and press ENTR pushbutton on the DSKY.

129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

CTS UPLINK TAPE LOAD PROCEDURES

IRIG AND PIPA TEST (Low Voltage)

120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

122. Press EXECUTE pushbutton on Programmer and Monitor panel.

123. Repeat steps 114 through 119.

IRIG AND PIPA TEST (High Voltage)

124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, -0.25) vdc. Record indication.

126. Press EXECUTE pushbutton on Programmer and Monitor panel.

127. Repeat steps 114 through 119.

128. Press EXECUTE pushbutton on Programmer and Monitor panel.

129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

132. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

133. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

134. Set AGREEMENT B switch on Logic Drawer No. 2 to OFF and then set AGREEMENT B digitswitches to XXXXXXXX.

135. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

136. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RESET pushbutton on DSKY.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12206
REV. N
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 111	Displays	All DSKY character and condition lamps performed as required						
113	CGC 28 vdc Bus	vdc	28.50		29.10			a
114	Self Test Failures	▨	▨		▨			
117	gravity	cm/sec^2	975.0	R1 — — — — — R2 — — — — —	985.9			b
119	Horizontal earth rate (R2)	ERU	See Table 1	0. — — — — — — —	See Table 1			c
	Self Test Failures	▨	▨		▨			
121	CGC 28 vdc Bus	vdc	25.80		26.05			d
123 (114)	Self Test Failures	▨	▨		▨			
123 (117)	gravity	cm/sec^2	975.0	R1 — — — — — R2 — — — — —	985.9			e
123 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. — — — — — —	See Table 1			f
	Self Test Failures	▨	▨		▨			

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12206
REV. N

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
125	CGC 28 vdc Bus	vdc	31.55		31.8			g
127 (114)	Self Test Failures	▨	▨		▨			
127 (117)	gravity	cm/sec^2	975.0	R1 — — — — — R2 — — — — —	985.9			h
127 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. — — — — — —	See Table 1			i
	Self Test Failures	▨	▨		▨			
131	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
131	line j = line b - line e = ____ line k = (line c - line f) x 10^3 = ____ line l = line b - line h = ____ line m = (line c - line i) x 10^3 = ____

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12206
REV. N

JOB G & N SYSTEM OPERATIONAL TEST

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table I

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JOB G & N SYSTEM OPERATIONAL TEST | **JDC** 12206 **REV.** P **PAGE** 1 **OF** 25
INITIAL TDRR 29882 **D.S. PGS** 3

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-
H	3-9-67	33188	1-5	All	EA	-
J	7-20-67	34177	1	-	SB	-
K	11-9-67	35022	3,6,7	2	EA	-
L	1-4-68	35353	2,3,6	All	EA BD	-
M	5-29-68	36278	All	All	EA BD	-
N	8-26-68	36714	7-10, 13	1,2	EA JF	-
P	1-28-69	37270	1,3,10	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL JDC 12206 CTS UPLINK Tape, P/N 2901626-002

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM OPERATIONAL TEST | **JDC** 12206 **REV** P **PAGE** 2 **OF** 25

SUBSYSTEM G & N SYSTEM | **ASSY**

INITIALIZATION

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate Power is applied.

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: 1. Insure steps 2 through 30 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 30 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 30 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 115.

3. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP
ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHT-WATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM
ALARMS #18 - E-MEMORY PARITY FAIL　CTS P/N 2014042-071 only

2. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 27 ENTR
c. 00011 ENTR

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JOB G & N SYSTEM OPERATIONAL TEST | **JDC** 12206 **REV** P **PAGE** 3 **OF** 25

SUBSYSTEM G & N SYSTEM | **ASSY**

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable character electroluminescent elements and all pushbutton electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2, and Row 3
l. VERB-NOUN Flashing
m. COMP ACTY
(k through m) on concurrently for approx. 5 seconds

n. Plus signs in Row 1, Row 2, and Row 3
o. VERB-NOUN Flashing
p. COMP ACTY
(n through p) on concurrently for approx. 5 seconds

q. COMP ACTY ______ on for approx. 5 seconds, then DSKY blanks

NOTE: Insure that CONDITION LAMPS switch on Indicator Control panel is set to ON.

4. Enter VERB 35 and press ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds:

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEL REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
(a through j) on concurrently for approx. 5 seconds

k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2, and Row 3
(k through m) on concurrently for approx. 5 seconds (CMC remains on 10 to 20 seconds after other lamps go out)

After indications a through l go out, plus 88888's shall remain on Row 1, Row 2, and Row 3.

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JOB G & N SYSTEM OPERATIONAL TEST | **JDC** 12206 **REV** P **PAGE** 4 **OF** 25

SUBSYSTEM G & N SYSTEM | **ASSY**

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe:
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe:
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe:
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 NOUN 01 continue flashing.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedure in this JDC.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS: (A) XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9. (B) Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons. (C) Logic Drawer No. 2 - Set AGREEMENT B digit-switches to X01X3070. Set AGREEMENT B switch to STOP. (D) RDC Interface panel - Press to light CH33-10 pushbutton. (E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	(E) Tape Reader (cont) - Programmer and Monitor panel and press RSET pushbutton on DSKY. (F) Programmer and Monitor panel - Press EXECUTE pushbutton. (G) Verify that tape advances to beginning of first UPLINK code. (H) Programmer and Monitor panel - Press EXECUTE pushbutton. (I) Verify that AGREEMENT B lamp on Logic Drawer NO. 2 is not lighted.
ALARM AND INTERRUPT TEST PARITY FAIL TEST	ALARM AND INTERRUPT TEST PARITY FAIL TEST
8. Perform following DSKY operations: a. VERB 36 ENTR b. VERB 21 NOUN 01 ENTR c. 03700 ENTR d. 33663 ENTR e. NOUN 15 ENTR f. 55426 ENTR ENTR g. 04064 ENTR ENTR h. 15374 ENTR i. VERB 25 NOUN 26 ENTR	8. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that DSKY blanks except PROG indicates 00.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
j. 01000 ENTR k. 01700 ENTR l. 12007 ENTR m. VERB 30 ENTR n. Observe: DSKY blanks except PROG indicates 00.	
9. Enter VERB 27 NOUN 01 and press ENTR pushbutton on the DSKY.	9. Press EXECUTE pushbutton on Programmer and Monitor panel.
10. Observe that VERB 27 NOUN 01 flash on the DSKY.	10. Observe that VERB 27 NOUN 01 flash on the DSKY.
11. Enter 70000 and press ENTR pushbutton on the DSKY.	11. Press EXECUTE pushbutton on Programmer and Monitor panel.
12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.	12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.
13. Press the RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.	13. Press RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.
14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
15. Enter VERB 36 and press ENTR pushbutton on the DSKY. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.	15. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RUPT LOCK	RUPT LOCK
16. Perform following DSKY operations: a. VERB 25 NOUN 01 ENTR b. 01600 ENTR c. 00004 ENTR d. 30007 ENTR e. 01601 ENTR f. VERB 25 NOUN 26 ENTR g. 00001 ENTR h. 01600 ENTR i. 00003 ENTR j. VERB 31 ENTR Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.	16. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.
17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
18. Enter VERB 36 and press ENTR pushbutton on the DSKY.	18. Press EXECUTE pushbutton on Programmer and Monitor panel.
19. Perform following DSKY operations: a. VERB 21 NOUN 26 ENTR b. 01000 ENTR c. VERB 30 ENTR	19. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

22. Enter VERB 36 and press ENTR pushbutton on the DSKY.

TC TRAP TEST

23. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01600 ENTR
c. 01600 ENTR
d. VERB 30 ENTR

24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

CTS UPLINK TAPE LOAD PROCEDURES

20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

22. Press EXECUTE pushbutton on Programmer and Monitor panel.

TC TRAP TEST

23. Press EXECUTE pushbutton on Programmer and Monitor panel.

24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

MANUAL LOAD PROCEDURES

25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 02 ENTR
c. 01600 ENTR
d. 30067 ENTR
e. NOUN 15 ENTR
f. 31604 ENTR ENTR
g. 22000 ENTR ENTR
h. 22005 ENTR ENTR
i. 01600 ENTR
j. VERB 30 ENTR

26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed, and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26C. Enter VERB 36 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.

26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 of the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26C. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

NIGHT WATCHMAN TEST

27. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. 01600 ENTR
c. 30001 ENTR
d. 01600 ENTR
e. VERB 30 ENTR

28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.

29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

30. Enter VERB 36 and press ENTR pushbutton on the DSKY.

SECOND DSKY CHECK

NOTE: Disregard step 31 if only one DSKY is used in system under test.

31. Repeat steps 2 through 30 for the second DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

NIGHT WATCHMAN TEST

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.

29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

30. Press EXECUTE pushbutton on Programmer and Monitor panel.

SECOND DSKY CHECK

NOTE: Disregard step 31 if only one DSKY is used in system under test.

31. Repeat steps 2 through 30 for the second DSKY. Reload the UPLINK Tape in the Tape Reader at the beginning of the tape.

MANUAL LOAD PROCEDURES

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

T5/T6 RUPT TEST

32. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 31304 ENTR
d. NOUN 15 ENTR
e. 00006 ENTR ENTR
f. 05013 ENTR ENTR
g. 04511 ENTR ENTR
h. 40000 ENTR ENTR
i. 31312 ENTR ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

T5/T6 RUPT TEST

32. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
j. 54030 ENTR ENTR	
k. 31313 ENTR ENTR	
l. 54345 ENTR ENTR	
m. 04353 ENTR ENTR	
n. 36027 ENTR ENTR	
o. 01314 ENTR ENTR	
p. 04572 ENTR ENTR	
q. 00011 ENTR ENTR	
r. 01300 ENTR	
s. VERB 25 NOUN 26 ENTR	
t. 01000 ENTR	
u. 01305 ENTR	
v. 00002 ENTR	
w. VERB 21 NOUN 01 ENTR	
x. 00031 ENTR	
y. 37777 ENTR	
z. VERB 11 NOUN 01 ENTR	
aa. 00031 ENTR	
NOTE: DSKY key entries made during steps 32 through 39 may cause the KEY REL indicator to flash.	
33. Press to light MONITOR pushbutton on Programmer and Monitor panel. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.	33. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.
34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RG display does not indicate 34055.
35. Enter VERB 30 and press ENTR pushbutton on the DSKY.	35. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.	36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.
37. Perform following DSKY operations:	37. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 36 ENTR	
b. VERB 21 NOUN 01 ENTR	
c. 00031 ENTR	
d. 40000 ENTR	
e. VERB 11 NOUN 01 ENTR	
f. 00031 ENTR	
38. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	38. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.
39. Enter VERB 30 and press ENTR pushbutton on the DSKY.	39. Press EXECUTE pushbutton on Programmer and Monitor panel.
40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.	40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.
41. Enter VERB 36 and press ENTR pushbutton on the DSKY.	41. Press EXECUTE pushbutton on Programmer and Monitor panel.
RADAR RUPT TEST	RADAR RUPT TEST
42. Perform following DSKY operations:	42. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24 NOUN 01 ENTR	
b. 01303 ENTR	
c. 04353 ENTR	
d. 00010 ENTR	
e. VERB 22 NOUN 26 ENTR	
f. 01300 ENTR	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.
44. Enter VERB 30 and press ENTR pushbutton on the DSKY.	44. Press EXECUTE pushbutton on Programmer and Monitor panel.
45. Verify that RZ display on Programmer and Monitor panel indicates 4046.	45. Verify that RG display indicates 34062.
T10 RUPT TEST	T10 RUPT TEST
46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.	46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.
47. Perform following DSKY operations:	47. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 01 ENTR	
b. 01304 ENTR	
c. 04000 ENTR	
d. VERB 30 ENTR	
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.
51. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	51. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
52. Enter VERB 30 and press ENTR pushbutton on the DSKY.	52. Press EXECUTE pushbutton on Programmer and Monitor panel.
53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that	53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.
55. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	55. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
56. Enter VERB 30 and press ENTR pushbutton on the DSKY.	56. Press EXECUTE pushbutton on Programmer and Monitor panel.
57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.
59. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	59. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
60. Enter VERB 30 and press ENTR pushbutton on the DSKY.	60. Press EXECUTE pushbutton on Programmer and Monitor panel.
61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.
63. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	63. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
64. Enter VERB 30 and press ENTR pushbutton on the DSKY.	64. Press EXECUTE pushbutton on Programmer and Monitor panel.
65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that	65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.
67. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	67. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
68. Enter VERB 30 and press ENTR pushbutton on the DSKY.	68. Press EXECUTE pushbutton on Programmer and Monitor panel.
69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.
71. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	71. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
72. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	72. Press EXECUTE pushbutton on Programmer and Monitor panel.
73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.
75. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	75. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
76. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	76. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.
79. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	79. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
80. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	80. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.
83. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	83. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
84. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	84. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.
87. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	87. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	88. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.
91. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	91. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
92. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	92. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.
95. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
96. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	96. Press EXECUTE pushbutton on Programmer and Monitor panel.
97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display indicates 0.	97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and monitor panel does not indicate 34063.
100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
101. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	101. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on	102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	indicates 34063. Release Attitude Impulse Hand Controller.
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
105. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	105. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
109. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	109. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
110. Enter VERB 36 and press ENTR pushbutton on DSKY.	110. Press EXECUTE pushbutton on Programmer and Monitor panel.
IRIG AND PIPA TEST INITIALIZATION	IRIG AND PIPA TEST INITIALIZATION
111. Press ISS OPERATE pushbutton on Test Control panel.	111. Press ISS OPERATE pushbutton on Test Control panel.
112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.	112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.
113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.	113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.
CGC SELF CHECK	CGC SELF CHECK
114. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 00010 ENTR	114. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and monitor panel. 114A. When VERB 21 NOUN 27 flashes on the DSKY, press EXECUTE pushbutton on

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.	Programmer and Monitor panel. Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.
IRIG AND PIPA TEST (Nominal Voltage)	IRIG AND PIPA TEST (Nominal Voltage)
115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.	115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.
116. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. Observe: NO ATT lamp lights momentarily and then goes out f. VERB 34 ENTR	116. Press EXECUTE pushbutton on Programmer and Monitor panel. 116A. When VERB 21 NOUN 01 flashes on the DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 116B. When VERB 16 NOUN 20 is displayed on the DSKY, observe that the NO ATT lamp lights momentarily and then goes out. 116C. Press EXECUTE pushbutton on Programmer and Monitor panel.
117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.	117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.
118. Enter VERB 33 and press ENTR pushbutton on the DSKY.	118. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.	119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.
IRIG AND PIPA TEST (Low Voltage)	IRIG AND PIPA TEST (Low Voltage)
120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.
121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.	121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.
122. Enter VERB 36 and press ENTR pushbutton on the DSKY.	122. Press EXECUTE pushbutton on Programmer and Monitor panel.
123. Repeat steps 114 through 119.	123. Repeat steps 114 through 119.
IRIG AND PIPA TEST (High Voltage)	IRIG AND PIPA TEST (High Voltage)
124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.
125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, -0.25) vdc. Record indication.	125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, -0.25) vdc. Record indication.
126. Enter VERB 36 and press ENTR pushbutton on the DSKY.	126. Press EXECUTE pushbutton on Programmer and Monitor panel.
127. Repeat steps 114 through 119.	127. Repeat steps 114 through 119.
128. Enter VERB 36 and press ENTR pushbutton on the DSKY.	128. Press EXECUTE pushbutton on Programmer and Monitor panel.
129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

130. Adjust the G& N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

CTS UPLINK TAPE LOAD PROCEDURES

130. Adjust the G& N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

132. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

133. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

134. Set AGREEMENT B switch on Logic Drawer No. 2 to OFF and then set AGREEMENT B digitswitches to XXXXXXXX.

135. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

136. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12206
REV. P
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION ____ APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 111	Displays	All DSKY character and condition lamps performed as required						
113	CGC 28 vdc Bus	vdc	28.50		29.10			a
114	Self Test Failures	▨	▨		▨			
117	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
119	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			c
	Self Test Failures	▨	▨		▨			
121	CGC 28 vdc Bus	vdc	25.80		26.05			d
123 (114)	Self Test Failures	▨	▨		▨			
123 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
123 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			f
	Self Test Failures	▨	▨		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12206
REV P

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
125	CGC 28 vdc Bus	vdc	31.55		31.8			g
127 (114)	Self Test Failures	▨	▨		▨			
127 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			h
127 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			i
	Self Test Failures	▨	▨		▨			
131	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
131	line j = line b - line e = ______ line k = (line c - line f) x 10^3 = ______ line l = line b - line h = ______ line m = (line c - line i) x 10^3 = ______

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12206
REV P

JOB G & N SYSTEM OPERATIONAL TEST

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table I

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. R PAGE 1 OF 25
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-
H	3-9-67	33188	1-5	All	EA	-
J	7-20-67	34177	1	-	SB	-
K	11-9-67	35022	3,6,7	2	EA	-
L	1-4-68	35353	2,3,6	All	EA BD	-
M	5-29-68	36278	All	All	EA BD	-
N	8-26-68	36714	7-10,13	1,2	EA JF	-
P	1-28-69	37270	1,3,10	-	EA	-
R	3-11-69	37401	1,4,8,25	-	EA BD	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL JDC 12206 CTS UPLINK Tape P/N 2901626-003

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV R PAGE 2 OF 25

SUBSYSTEM G & N SYSTEM | ASSY

INITIALIZATION

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate Power is applied.

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: 1. Insure steps 2 through 30 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 30 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 30 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 115.

3. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP
ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHT-WATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM
ALARMS #18 - E-MEMORY PARITY FAIL

CTS P/N 2014042-071 only

2. Perform following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 21	NOUN 27	ENTR
c.	00011		ENTR

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3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable character electroluminescent elements and all pushbutton electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2, and Row 3
l. VERB-NOUN Flashing
m. COMP ACTY

on concurrently for approx. 5 seconds

n. Plus signs in Row 1, Row 2, and Row 3
o. VERB-NOUN Flashing
p. COMP ACTY

on concurrently for approx. 5 seconds

q. COMP ACTY ______ on for approx. 5 seconds, then DSKY blanks

NOTE: Insure that CONDITION LAMPS switch on Indicator Control panel is set to ON.

4. Enter VERB 35 and press ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds:

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEL REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing

on concurrently for approx. 5 seconds

k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2, and Row 3

on concurrently for approx. 5 seconds (CMC remains on 10 to 20 seconds after other lamps go out)

After indications a through l go out, plus 88888's shall remain on Row 1, Row 2, and Row 3.

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MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe:		
	VERB 24	NOUN 01	Flashing
c.	01700		ENTR
d.	Observe:		
	VERB 21	NOUN 01	Flashing
e.	+12345		ENTR
f.	Observe:		
	VERB 22	NOUN 01	Flashing
g.	-67890	Do NOT press ENTR	

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 NOUN 01 continue flashing.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedure in this JDC.

3. Insure that UP TELEMETRY switch on Indicator Control panel is set to ACCEPT when performing the CTS UPLINK TAPE LOAD PROCEDURES.

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MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

(B) Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(C) Logic Drawer No. 2 - Set AGREEMENT B digit-switches to X01X3070. Set AGREEMENT B switch to STOP.

(D) RDC Interface panel - Press to light CH33-10 pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on

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MANUAL LOAD PROCEDURES

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

(E) Tape Reader (cont) - Programmer and Monitor panel and press RSET pushbutton on DSKY.

(F) Programmer and Monitor panel - Press EXECUTE pushbutton.

(G) Verify that tape advances to beginning of first UPLINK code.

(H) Programmer and Monitor panel - Press EXECUTE pushbutton.

(I) Verify that AGREEMENT B lamp on Logic Drawer NO. 2 is not lighted.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that DSKY blanks except PROG indicates 00.

MANUAL LOAD PROCEDURES

j. 01000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR
n. Observe:
DSKY blanks except PROG indicates 00.

9. Enter VERB 27 NOUN 01 and press ENTR pushbutton on the DSKY.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Enter 70000 and press ENTR pushbutton on the DSKY.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press the RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Enter VERB 36 and press ENTR pushbutton on the DSKY. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

CTS UPLINK TAPE LOAD PROCEDURES

9. Press EXECUTE pushbutton on Programmer and Monitor panel.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

MANUAL LOAD PROCEDURES

RUPT LOCK

16. Perform following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 01600 ENTR
c. 00004 ENTR
d. 30067 ENTR
e. 01601 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01600 ENTR
i. 00003 ENTR
j. VERB 31 ENTR

Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Enter VERB 36 and press ENTR pushbutton on the DSKY.

19. Perform following DSKY operations:

a. VERB 21 NOUN 26 ENTR
b. 01000 ENTR
c. VERB 30 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

RUPT LOCK

16. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Press EXECUTE pushbutton on Programmer and Monitor panel.

19. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.	20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.
21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
22. Enter VERB 36 and press ENTR pushbutton on the DSKY.	22. Press EXECUTE pushbutton on Programmer and Monitor panel.
TC TRAP TEST	TC TRAP TEST
23. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01600 ENTR c. 01600 ENTR d. VERB 30 ENTR	23. Press EXECUTE pushbutton on Programmer and Monitor panel.
24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.	24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.	25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.
26. Perform following DSKY operations: a. VERB 36 ENTR b. VERB 21 NOUN 02 ENTR c. 01600 ENTR d. 30067 ENTR e. NOUN 15 ENTR f. 31604 ENTR ENTR g. 22000 ENTR ENTR h. 22005 ENTR ENTR i. 01600 ENTR j. VERB 30 ENTR	26. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.
26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed, and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.	26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 of the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.
26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.	26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.
26C. Enter VERB 36 and press ENTR pushbutton on DSKY.	26C. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NIGHT WATCHMAN TEST	NIGHT WATCHMAN TEST
27. Perform following DSKY operations: a. VERB 24 NOUN 01 ENTR b. 01600 ENTR c. 30001 ENTR d. 01600 ENTR e. VERB 30 ENTR	27. Press EXECUTE pushbutton on Programmer and Monitor panel.
28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.	28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.
29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
30. Enter VERB 36 and press ENTR pushbutton on the DSKY.	30. Press EXECUTE pushbutton on Programmer and Monitor panel.
SECOND DSKY CHECK	SECOND DSKY CHECK
NOTE: Disregard step 31 if only one DSKY is used in system under test.	NOTE: Disregard step 31 if only one DSKY is used in system under test.
31. Repeat steps 2 through 30 for the second DSKY.	31. Repeat steps 2 through 30 for the second DSKY. Reload the UPLINK Tape in the Tape Reader at the beginning of the tape.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.	NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.
T5/T6 RUPT TEST	T5/T6 RUPT TEST
32. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01300 ENTR c. 31304 ENTR d. NOUN 15 ENTR e. 00006 ENTR ENTR f. 05013 ENTR ENTR g. 04511 ENTR ENTR h. 40000 ENTR ENTR i. 31312 ENTR ENTR	32. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
j. 54030 ENTR ENTR k. 31313 ENTR ENTR l. 54345 ENTR ENTR m. 04353 ENTR ENTR n. 36027 ENTR ENTR o. 01314 ENTR ENTR p. 04572 ENTR ENTR q. 00011 ENTR ENTR r. 01300 ENTR s. VERB 25 NOUN 26 ENTR t. 01000 ENTR u. 01305 ENTR v. 00002 ENTR w. VERB 21 NOUN 01 ENTR x. 00031 ENTR y. 37777 ENTR z. VERB 11 NOUN 01 ENTR aa. 00031 ENTR NOTE: DSKY key entries made during steps 32 through 39 may cause the KEY REL indicator to flash.	
33. Press to light MONITOR pushbutton on Programmer and Monitor panel. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.	33. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.
34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RG display does not indicate 34055.
35. Enter VERB 30 and press ENTR pushbutton on the DSKY.	35. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.	36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.
37. Perform following DSKY operations: a. VERB 36 ENTR b. VERB 21 NOUN 01 ENTR c. 00031 ENTR d. 40000 ENTR e. VERB 11 NOUN 01 ENTR f. 00031 ENTR	37. Press EXECUTE pushbutton on Programmer and Monitor panel.
38. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	38. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.
39. Enter VERB 30 and press ENTR pushbutton on the DSKY.	39. Press EXECUTE pushbutton on Programmer and Monitor panel.
40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.	40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.
41. Enter VERB 36 and press ENTR pushbutton on the DSKY.	41. Press EXECUTE pushbutton on Programmer and Monitor panel.
RADAR RUPT TEST	RADAR RUPT TEST
42. Perform following DSKY operations: a. VERB 24 NOUN 01 ENTR b. 01303 ENTR c. 04353 ENTR d. 00010 ENTR e. VERB 22 NOUN 26 ENTR f. 01300 ENTR	42. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.
44. Enter VERB 30 and press ENTR pushbutton on the DSKY.	44. Press EXECUTE pushbutton on Programmer and Monitor panel.
45. Verify that RZ display on Programmer and Monitor panel indicates 4046.	45. Verify that RG display indicates 34062.
T10 RUPT TEST	T10 RUPT TEST
46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.	46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.
47. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 04000 ENTR d. VERB 30 ENTR	47. Press EXECUTE pushbutton on Programmer and Monitor panel.
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.
51. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	51. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
52. Enter VERB 30 and press ENTR pushbutton on the DSKY.	52. Press EXECUTE pushbutton on Programmer and Monitor panel.
53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that	53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.
55. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	55. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
56. Enter VERB 30 and press ENTR pushbutton on the DSKY.	56. Press EXECUTE pushbutton on Programmer and Monitor panel.
57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.
59. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	59. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
60. Enter VERB 30 and press ENTR pushbutton on the DSKY.	60. Press EXECUTE pushbutton on Programmer and Monitor panel.
61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.
63. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	63. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
64. Enter VERB 30 and press ENTR pushbutton on the DSKY.	64. Press EXECUTE pushbutton on Programmer and Monitor panel.
65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that	65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.
67. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	67. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
68. Enter VERB 30 and press ENTR pushbutton on the DSKY.	68. Press EXECUTE pushbutton on Programmer and Monitor panel.
69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.
71. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	71. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
72. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	72. Press EXECUTE pushbutton on Programmer and Monitor panel.
73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.
75. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	75. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
76. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	76. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.
79. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	79. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
80. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	80. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.
83. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	83. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
84. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	84. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.
87. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	87. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	88. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.
91. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	91. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
92. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	92. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.
95. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
96. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	96. Press EXECUTE pushbutton on Programmer and Monitor panel.
97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display indicates 0.	97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and monitor panel does not indicate 34063.
100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
101. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	101. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on	102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display

MANUAL LOAD PROCEDURES

Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.

103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.

105. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.

107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

CTS UPLINK TAPE LOAD PROCEDURES

indicates 34063. Release Attitude Impulse Hand Controller.

103. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.

105. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.

107. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

MANUAL LOAD PROCEDURES

108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.

109. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

110. Enter VERB 36 and press ENTR pushbutton on DSKY.

IRIG AND PIPA TEST INITIALIZATION

111. Press ISS OPERATE pushbutton on Test Control panel.

112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.

CGC SELF CHECK

114. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. Observe:

VERB 21 NOUN 27 Flashing

c. 00010 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.

109. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

110. Press EXECUTE pushbutton on Programmer and Monitor panel.

IRIG AND PIPA TEST INITIALIZATION

111. Press ISS OPERATE pushbutton on Test Control panel.

112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.

CGC SELF CHECK

114. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and monitor panel.

114A. When VERB 21 NOUN 27 flashes on the DSKY, press EXECUTE pushbutton on

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MANUAL LOAD PROCEDURES

Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.

IRIG AND PIPA TEST (Nominal Voltage)

115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.

116. Perform following DSKY operations:

a. VERB 57 ENTR

b. Observe:

VERB 21 NOUN 01 Flashing

c. 00004 ENTR

d. Observe:

VERB 16 NOUN 20 Displayed

e. Observe:

NO ATT lamp lights momentarily and then goes out

f. VERB 34 ENTR

117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.

118. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

Programmer and Monitor panel. Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.

IRIG AND PIPA TEST (Nominal Voltage)

115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.

116. Press EXECUTE pushbutton on Programmer and Monitor panel.

116A. When VERB 21 NOUN 01 flashes on the DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

116B. When VERB 16 NOUN 20 is displayed on the DSKY, observe that the NO ATT lamp lights momentarily and then goes out.

116C. Press EXECUTE pushbutton on Programmer and Monitor panel.

117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.

118. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.

IRIG AND PIPA TEST (Low Voltage)

120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

122. Enter VERB 36 and press ENTR pushbutton on the DSKY.

123. Repeat steps 114 through 119.

IRIG AND PIPA TEST (High Voltage)

124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, -0.25) vdc. Record indication.

126. Enter VERB 36 and press ENTR pushbutton on the DSKY.

127. Repeat steps 114 through 119.

128. Enter VERB 36 and press ENTR pushbutton on the DSKY.

129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

CTS UPLINK TAPE LOAD PROCEDURES

119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.

IRIG AND PIPA TEST (Low Voltage)

120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

122. Press EXECUTE pushbutton on Programmer and Monitor panel.

123. Repeat steps 114 through 119.

IRIG AND PIPA TEST (High Voltage)

124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, -0.25) vdc. Record indication.

126. Press EXECUTE pushbutton on Programmer and Monitor panel.

127. Repeat steps 114 through 119.

128. Press EXECUTE pushbutton on Programmer and Monitor panel.

129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

CTS UPLINK TAPE LOAD PROCEDURES

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

132. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

133. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

134. Set AGREEMENT B switch on Logic Drawer No. 2 to OFF and then set AGREEMENT B digitswitches to XXXXXXXX.

135. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

136. Rewind and remove tape from Tape Reader and set Power switch to OFF. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12206
REV. R
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 111	Displays	All DSKY character and condition lamps performed as required						
113	CGC 28 vdc Bus	vdc	28.50		29.10			a
114	Self Test Failures	▨	▨		▨			
117	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
119	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			c
	Self Test Failures	▨	▨		▨			
121	CGC 28 vdc Bus	vdc	25.80		26.05			d
123 (114)	Self Test Failures	▨	▨		▨			
123 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
123 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			f
	Self Test Failures	▨	▨		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12206
REV R

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
125	CGC 28 vdc Bus	vdc	31.55		31.8			g
127 (114)	Self Test Failures	▨	▨		▨			
127 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			h
127 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			i
	Self Test Failures	▨	▨		▨			
131	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
131	line j = line b - line e = ______ line k = (line c - line f) x 10^3 = ______ line l = line b - line h = ______ line m = (line c - line i) x 10^3 = ______

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12206
REV. R

JOB G & N SYSTEM OPERATIONAL TEST

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table I

DATE 30 JUN 66

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. S PAGE 1 OF 25
INITIAL TDRR 29882 D.S. PGS. 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-
H	3-9-67	33188	1-5	All	EA	-
J	7-20-67	34177	1	-	SB	-
K	11-9-67	35022	3,6,7	2	EA	-
L	1-4-68	35353	2,3,6	All	EA BD	-
M	5-29-68	36278	All	All	EA BD	-
N	8-26-68	36714	7-10, 13	1,2	EA JF	-
P	1-28-69	37270	1,3,10	-	EA	-
R	3-11-69	37401	1,4,8,25	-	EA BD	-
S	3-27-69	37449	1, 13	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL JDC 12206 CTS UPLINK Tape P/N 2901626-004

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV S PAGE 2 OF 25

SUBSYSTEM G & N SYSTEM | ASSY

INITIALIZATION

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate Power is applied.

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: 1. Insure steps 2 through 30 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 30 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 30 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Perform following DSKY operations:
a. VERB 36 ENTR
b. VERB 21 NOUN 27 ENTR
c. 00011 ENTR

2. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 115.

3. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP
ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHT-WATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM
ALARMS #18 - E-MEMORY PARITY FAIL

CTS P/N 2014042-071 only

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV S PAGE 3 OF 25

SUBSYSTEM G & N SYSTEM | ASSY

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable character electroluminescent elements and all pushbutton electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's

k. Minus signs in Row 1, Row 2, and Row 3
l. VERB-NOUN Flashing
m. COMP ACTY
} on concurrently for approx. 5 seconds

n. Plus signs in Row 1, Row 2, and Row 3
o. VERB-NOUN Flashing
p. COMP ACTY
} on concurrently for approx. 5 seconds

q. COMP ACTY ______ on for approx. 5 seconds, then DSKY blanks

NOTE: Insure that CONDITION LAMPS switch on Indicator Control panel is set to ON.

4. Enter VERB 35 and press ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds:

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEL REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
} on concurrently for approx. 5 seconds

k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2, and Row 3
} on concurrently for approx. 5 seconds (CMC remains on 10 to 20 seconds after other lamps go out)

After indications a through l go out, plus 88888's shall remain on Row 1, Row 2, and Row 3.

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV S PAGE 4 OF 25

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:
a. VERB 24 NOUN 01 ENTR
b. Observe:
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe:
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe:
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 NOUN 01 continue flashing.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedure in this JDC.

3. Insure that UP TELEMETRY switch on Indicator Control panel is set to ACCEPT when performing the CTS UPLINK TAPE LOAD PROCEDURES.

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MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

(B) Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(C) Logic Drawer No. 2 - Set AGREEMENT B digit-switches to X01X3070. Set AGREEMENT B switch to STOP.

(D) RDC Interface panel - Press to light CH33-10 pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on

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MANUAL LOAD PROCEDURES

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform following DSKY operations:

a.	VERB 36		ENTR	
b.	VERB 21	NOUN 01	ENTR	
c.	03700		ENTR	
d.	33663		ENTR	
e.		NOUN 15	ENTR	
f.	55426		ENTR	ENTR
g.	04064		ENTR	ENTR
h.	15374		ENTR	
i.	VERB 25	NOUN 26	ENTR	

CTS UPLINK TAPE LOAD PROCEDURES

(E) Tape Reader (cont) - Programmer and Monitor panel and press RSET pushbutton on DSKY.

(F) Programmer and Monitor panel - Press EXECUTE pushbutton.

(G) Verify that tape advances to beginning of first UPLINK code.

(H) Programmer and Monitor panel - Press EXECUTE pushbutton.

(I) Verify that AGREEMENT B lamp on Logic Drawer NO. 2 is not lighted.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that DSKY blanks except PROG indicates 00.

MANUAL LOAD PROCEDURES

j.	01000	ENTR
k.	01700	ENTR
l.	12007	ENTR
m.	VERB 30	ENTR

n. Observe:

DSKY blanks except PROG indicates 00.

9. Enter VERB 27 NOUN 01 and press ENTR pushbutton on the DSKY.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Enter 70000 and press ENTR pushbutton on the DSKY.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press the RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Enter VERB 36 and press ENTR pushbutton on the DSKY. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

CTS UPLINK TAPE LOAD PROCEDURES

9. Press EXECUTE pushbutton on Programmer and Monitor panel.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press the RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

MANUAL LOAD PROCEDURES

RUPT LOCK

16. Perform following DSKY operations:

a.	VERB 25	NOUN 01	ENTR
b.	01600		ENTR
c.	00004		ENTR
d.	30067		ENTR
e.	01601		ENTR
f.	VERB 25	NOUN 26	ENTR
g.	00001		ENTR
h.	01600		ENTR
i.	00003		ENTR
j.	VERB 31		ENTR

Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Enter VERB 36 and press ENTR pushbutton on the DSKY.

19. Perform following DSKY operations:

a.	VERB 21	NOUN 26	ENTR
b.	01000		ENTR
c.	VERB 30		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

RUPT LOCK

16. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Press EXECUTE pushbutton on Programmer and Monitor panel.

19. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.	20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.
21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
22. Enter VERB 36 and press ENTR pushbutton on the DSKY.	22. Press EXECUTE pushbutton on Programmer and Monitor panel.
TC TRAP TEST	TC TRAP TEST
23. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01600 ENTR c. 01600 ENTR d. VERB 30 ENTR	23. Press EXECUTE pushbutton on Programmer and Monitor panel.
24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.	24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.	25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.
26. Perform following DSKY operations: a. VERB 36 ENTR b. VERB 21 NOUN 02 ENTR c. 01600 ENTR d. 30067 ENTR e. NOUN 15 ENTR f. 31604 ENTR ENTR g. 22000 ENTR ENTR h. 22005 ENTR ENTR i. 01600 ENTR j. VERB 30 ENTR	26. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.
26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed, and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.	26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 of the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.
26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.	26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.
26C. Enter VERB 36 and press ENTR pushbutton on DSKY.	26C. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NIGHT WATCHMAN TEST	NIGHT WATCHMAN TEST
27. Perform following DSKY operations: a. VERB 24 NOUN 01 ENTR b. 01600 ENTR c. 30001 ENTR d. 01600 ENTR e. VERB 30 ENTR	27. Press EXECUTE pushbutton on Programmer and Monitor panel.
28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.	28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.
29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
30. Enter VERB 36 and press ENTR pushbutton on the DSKY.	30. Press EXECUTE pushbutton on Programmer and Monitor panel.
SECOND DSKY CHECK	SECOND DSKY CHECK
NOTE: Disregard step 31 if only one DSKY is used in system under test.	NOTE: Disregard step 31 if only one DSKY is used in system under test.
31. Repeat steps 2 through 30 for the second DSKY.	31. Repeat steps 2 through 30 for the second DSKY. Reload the UPLINK Tape in the Tape Reader at the beginning of the tape.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.	NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.
T5/T6 RUPT TEST	T5/T6 RUPT TEST
32. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01300 ENTR c. 31304 ENTR d. NOUN 15 ENTR e. 00006 ENTR ENTR f. 05013 ENTR ENTR g. 04511 ENTR ENTR h. 40000 ENTR ENTR i. 31312 ENTR ENTR	32. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
j. 54030 ENTR ENTR	
k. 31313 ENTR ENTR	
l. 54345 ENTR ENTR	
m. 04353 ENTR ENTR	
n. 36027 ENTR ENTR	
o. 01314 ENTR ENTR	
p1. 00006 ENTR ENTR	
p2. 22012 ENTR ENTR	
p3. 22016 ENTR ENTR	
p4. 04572 ENTR ENTR	
q. 00011 ENTR ENTR	
r. 01300 ENTR	
s. VERB 25 NOUN 26 ENTR	
t. 01000 ENTR	
u. 01305 ENTR	
v. 00002 ENTR	
w. VERB 21 NOUN 01 ENTR	
x. 00031 ENTR	
y. 37777 ENTR	
z. VERB 11 NOUN 01 ENTR	
aa. 00031 ENTR	
NOTE: DSKY key entries made during steps 32 through 39 may cause the KEY REL indicator to flash.	
33. Press to light MONITOR pushbutton on Programmer and Monitor panel. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.	33. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.
34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RG display does not indicate 34055.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
35. Enter VERB 30 and press ENTR pushbutton on the DSKY.	35. Press EXECUTE pushbutton on Programmer and Monitor panel.
36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.	36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.
37. Perform following DSKY operations:	37. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 36 ENTR	
b. VERB 21 NOUN 01 ENTR	
c. 00031 ENTR	
d. 40000 ENTR	
e. VERB 11 NOUN 01 ENTR	
f. 00031 ENTR	
38. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	38. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.
39. Enter VERB 30 and press ENTR pushbutton on the DSKY.	39. Press EXECUTE pushbutton on Programmer and Monitor panel.
40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.	40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.
41. Enter VERB 36 and press ENTR pushbutton on the DSKY.	41. Press EXECUTE pushbutton on Programmer and Monitor panel.
RADAR RUPT TEST	RADAR RUPT TEST
42. Perform following DSKY operations:	42. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24 NOUN 01 ENTR	
b. 01303 ENTR	
c. 04353 ENTR	
d. 00010 ENTR	
e. VERB 22 NOUN 26 ENTR	
f. 01300 ENTR	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.
44. Enter VERB 30 and press ENTR pushbutton on the DSKY.	44. Press EXECUTE pushbutton on Programmer and Monitor panel.
45. Verify that RZ display on Programmer and Monitor panel indicates 4046.	45. Verify that RG display indicates 34062.
T10 RUPT TEST	T10 RUPT TEST
46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.	46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.
47. Perform following DSKY operations:	47. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 01 ENTR	
b. 01304 ENTR	
c. 04000 ENTR	
d. VERB 30 ENTR	
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.
51. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	51. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
52. Enter VERB 30 and press ENTR pushbutton on the DSKY.	52. Press EXECUTE pushbutton on Programmer and Monitor panel.
53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that	53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.
55. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	55. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
56. Enter VERB 30 and press ENTR pushbutton on the DSKY.	56. Press EXECUTE pushbutton on Programmer and Monitor panel.
57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.
59. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	59. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
60. Enter VERB 30 and press ENTR pushbutton on the DSKY.	60. Press EXECUTE pushbutton on Programmer and Monitor panel.
61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.
63. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	63. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
64. Enter VERB 30 and press ENTR pushbutton on the DSKY.	64. Press EXECUTE pushbutton on Programmer and Monitor panel.
65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that	65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.
67. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	67. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
68. Enter VERB 30 and press ENTR pushbutton on the DSKY.	68. Press EXECUTE pushbutton on Programmer and Monitor panel.
69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.
71. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	71. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
72. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	72. Press EXECUTE pushbutton on Programmer and Monitor panel.
73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.
75. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	75. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
76. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	76. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.
79. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	79. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
80. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	80. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.
83. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	83. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
84. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	84. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.
87. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	87. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	88. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.
91. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	91. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
92. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	92. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.
95. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
96. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	96. Press EXECUTE pushbutton on Programmer and Monitor panel.
97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display indicates 0.	97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and monitor panel does not indicate 34063.
100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
101. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	101. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on	102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	indicates 34063. Release Attitude Impulse Hand Controller.
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
105. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	105. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
109. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	109. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
110. Enter VERB 36 and press ENTR pushbutton on DSKY.	110. Press EXECUTE pushbutton on Programmer and Monitor panel.
IRIG AND PIPA TEST INITIALIZATION	IRIG AND PIPA TEST INITIALIZATION
111. Press ISS OPERATE pushbutton on Test Control panel.	111. Press ISS OPERATE pushbutton on Test Control panel.
112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.	112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.
113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.	113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.
CGC SELF CHECK	CGC SELF CHECK
114. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 00010 ENTR	114. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and monitor panel. 114A. When VERB 21 NOUN 27 flashes on the DSKY, press EXECUTE pushbutton on

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.	Programmer and Monitor panel. Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.
IRIG AND PIPA TEST (Nominal Voltage)	IRIG AND PIPA TEST (Nominal Voltage)
115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.	115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.
116. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. Observe: NO ATT lamp lights momentarily and then goes out f. VERB 34 ENTR	116. Press EXECUTE pushbutton on Programmer and Monitor panel. 116A. When VERB 21 NOUN 01 flashes on the DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 116B. When VERB 16 NOUN 20 is displayed on the DSKY, observe that the NO ATT lamp lights momentarily and then goes out. 116C. Press EXECUTE pushbutton on Programmer and Monitor panel.
117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.	117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.
118. Enter VERB 33 and press ENTR pushbutton on the DSKY.	118. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.	119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.
IRIG AND PIPA TEST (Low Voltage)	IRIG AND PIPA TEST (Low Voltage)
120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.
121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, −0) vdc. Record indication.	121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, −0) vdc. Record indication.
122. Enter VERB 36 and press ENTR pushbutton on the DSKY.	122. Press EXECUTE pushbutton on Programmer and Monitor panel.
123. Repeat steps 114 through 119.	123. Repeat steps 114 through 119.
IRIG AND PIPA TEST (High Voltage)	IRIG AND PIPA TEST (High Voltage)
124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.
125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, −0.25) vdc. Record indication.	125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, −0.25) vdc. Record indication.
126. Enter VERB 36 and press ENTR pushbutton on the DSKY.	126. Press EXECUTE pushbutton on Programmer and Monitor panel.
127. Repeat steps 114 through 119.	127. Repeat steps 114 through 119.
128. Enter VERB 36 and press ENTR pushbutton on the DSKY.	128. Press EXECUTE pushbutton on Programmer and Monitor panel.
129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV S PAGE 25 OF 25

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

CTS UPLINK TAPE LOAD PROCEDURES

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

132. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

133. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

134. Set AGREEMENT B switch on Logic Drawer No. 2 to OFF and then set AGREEMENT B digitswitches to XXXXXXXX.

135. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

136. Rewind and remove tape from Tape Reader and set Power switch to OFF. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12206
REV. S
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 111	Displays	All DSKY character and condition lamps performed as required						
113	CGC 28 vdc Bus	vdc	28.50		29.10			a
114	Self Test Failures	▨	▨					
117	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
119	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			c
	Self Test Failures	▨	▨		▨			
121	CGC 28 vdc Bus	vdc	25.80		26.05			d
123 (114)	Self Test Failures	▨	▨		▨			
123 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
123 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			f
	Self Test Failures	▨	▨		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12206
REV. S

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
125	CGC 28 vdc Bus	vdc	31.55		31.8			g
127 (114)	Self Test Failures	▨	▨		▨			
127 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			h
127 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			i
	Self Test Failures	▨	▨		▨			
131	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
131	line j = line b - line e = ______ line k = (line c - line f) x 10^3 = ______ line l = line b - line h = ______ line m = (line c - line i) x 10^3 = ______

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12206
REV. S

JOB G & N SYSTEM OPERATIONAL TEST

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table I

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. T PAGE 1 OF 25 | INITIAL TDRR 29882 D.S. PGS. 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-
H	3-9-67	33188	1-5	All	EA	-
J	7-20-67	34177	1	-	SB	-
K	11-9-67	35022	3,6,7	2	EA	-
L	1-4-68	35353	2,3,6	All	EA	-
M	5-29-68	36278	All	All	EA	-
N	8-26-68	36714	7-10, 13	1,2	EA JF	-
P	1-28-69	37270	1,3,10	-	EA	-
R	3-11-69	37401	1,4,8,25	-	EA	-
S	3-27-69	37449	1, 13	-	EA	-
T	8-11-69	37744	2	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL JDC 12206 CTS UPLINK Tape, P/N 2901626-004

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA 1_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV T PAGE 2 OF 25

SUBSYSTEM G & N SYSTEM | ASSY

3. When only one DSKY is available for testing, the following conditions will occur in steps 12, 16, 20, 24, 26A, and 28:
   a. With DSKY in NAV DSKY location, the G&N Caution lamp on the Monitor Panel will not light as specified.
   b. With DSKY in MAIN DSKY location, the PGNS lamp on the Indicator Control Panel will not light as specified.

INITIALIZATION

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate Power is applied.

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: 1. Insure steps 2 through 30 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 30 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 30 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 115.

3. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP
ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHT-WATCHMAN

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV T PAGE 3 OF 25

SUBSYSTEM G & N SYSTEM | ASSY

ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM
ALARMS #18 - E-MEMORY PARITY FAIL

CTS P/N 2014042-071 only

2. Perform following DSKY operations:
   a. VERB 36 ENTR
   b. VERB 21 NOUN 27 ENTR
   c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable character electroluminescent elements and all pushbutton electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:
   a. 9's
   b. 8's
   c. 7's
   d. 6's
   e. 5's
   f. 4's
   g. 3's
   h. 2's
   i. 1's
   j. 0's
   k. Minus signs in Row 1, Row 2, and Row 3
   l. VERB-NOUN Flashing
   m. COMP ACTY

   } on concurrently for approx. 5 seconds

   n. Plus signs in Row 1, Row 2, and Row 3
   o. VERB-NOUN Flashing
   p. COMP ACTY

   } on concurrently for approx. 5 seconds

   q. COMP ACTY ______ on for approx. 5 seconds, then DSKY blanks

NOTE: Insure that CONDITION LAMPS switch on Indicator Control panel is set to ON.

4. Enter VERB 35 and press ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds:
   a. UPLINK ACTY
   b. NO ATT (Momentarily on)
   c. STBY
   d. KEL REL Flashing
   e. TEMP
   f. GIMBAL LOCK
   g. PROG
   h. RESTART
   i. TRACKER
   j. OPR ERR Flashing

   } on concurrently for approx. 5 seconds

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV T PAGE 4 OF 25

SUBSYSTEM G & N SYSTEM | ASSY

   k. VERB-NOUN Flashing
   l. PGNS, CMC and ISS lamps on Indicator Control panel
   m. Plus 88888 in Row 1, Row 2, and Row 3

   } on concurrently for approx. 5 seconds (CMC remains on 10 to 20 seconds after other lamps go out)

After indications a through l go out, plus 88888's shall remain on Row 1, Row 2, and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:
   a. VERB 24 NOUN 01 ENTR
   b. Observe:
      VERB 24 NOUN 01 Flashing
   c. 01700 ENTR
   d. Observe:
      VERB 21 NOUN 01 Flashing
   e. +12345 ENTR
   f. Observe:
      VERB 22 NOUN 01 Flashing
   g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 NOUN 01 continue flashing.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedure in this JDC.

3. Insure that UP TELEMETRY switch on Indicator Control panel is set to ACCEPT when performing the CTS UPLINK TAPE LOAD PROCEDURES.

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MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

(B) Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(C) Logic Drawer No. 2 - Set AGREEMENT B digit-switches to X01X3070. Set AGREEMENT B switch to STOP.

(D) RDC Interface panel - Press to light CH33-10 pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on

MANUAL LOAD PROCEDURES

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform following DSKY operations:
a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

(E) Tape Reader (cont) - Programmer and Monitor panel and press RSET pushbutton on DSKY.

(F) Programmer and Monitor panel - Press EXECUTE pushbutton.

(G) Verify that tape advances to beginning of first UPLINK code.

(H) Programmer and Monitor panel - Press EXECUTE pushbutton.

(I) Verify that AGREEMENT B lamp on Logic Drawer NO. 2 is not lighted.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Press EXECUTE pushbutton on Programmer and Monitor panel.
Observe that DSKY blanks except PROG indicates 00.

MANUAL LOAD PROCEDURES

j. 01000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR
n. Observe:
DSKY blanks except PROG indicates 00.

9. Enter VERB 27 NOUN 01 and press ENTR pushbutton on the DSKY.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Enter 70000 and press ENTR pushbutton on the DSKY.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press the RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Enter VERB 36 and press ENTR pushbutton on the DSKY. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

CTS UPLINK TAPE LOAD PROCEDURES

9. Press EXECUTE pushbutton on Programmer and Monitor panel.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

MANUAL LOAD PROCEDURES

RUPT LOCK

16. Perform following DSKY operations:
a. VERB 25 NOUN 01 ENTR
b. 01600 ENTR
c. 00004 ENTR
d. 30067 ENTR
e. 01601 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01600 ENTR
i. 00003 ENTR
j. VERB 31 ENTR

Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Enter VERB 36 and press ENTR pushbutton on the DSKY.

19. Perform following DSKY operations:
a. VERB 21 NOUN 26 ENTR
b. 01000 ENTR
c. VERB 30 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

RUPT LOCK

16. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Press EXECUTE pushbutton on Programmer and Monitor panel.

19. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

22. Enter VERB 36 and press ENTR pushbutton on the DSKY.

TC TRAP TEST

23. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01600 ENTR
c. 01600 ENTR
d. VERB 30 ENTR

24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

CTS UPLINK TAPE LOAD PROCEDURES

20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

22. Press EXECUTE pushbutton on Programmer and Monitor panel.

TC TRAP TEST

23. Press EXECUTE pushbutton on Programmer and Monitor panel.

24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

MANUAL LOAD PROCEDURES

25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 02 ENTR
c. 01600 ENTR
d. 30067 ENTR
e. NOUN 15 ENTR
f. 31604 ENTR ENTR
g. 22000 ENTR ENTR
h. 22005 ENTR ENTR
i. 01600 ENTR
j. VERB 30 ENTR

26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed, and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26C. Enter VERB 36 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.

26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 of the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26C. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

NIGHT WATCHMAN TEST

27. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. 01600 ENTR
c. 30001 ENTR
d. 01600 ENTR
e. VERB 30 ENTR

28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.

29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

30. Enter VERB 36 and press ENTR pushbutton on the DSKY.

SECOND DSKY CHECK

NOTE: Disregard step 31 if only one DSKY is used in system under test.

31. Repeat steps 2 through 30 for the second DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

NIGHT WATCHMAN TEST

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.

29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

30. Press EXECUTE pushbutton on Programmer and Monitor panel.

SECOND DSKY CHECK

NOTE: Disregard step 31 if only one DSKY is used in system under test.

31. Repeat steps 2 through 30 for the second DSKY. Reload the UPLINK Tape in the Tape Reader at the beginning of the tape.

MANUAL LOAD PROCEDURES

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

T5/T6 RUPT TEST

32. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 31304 ENTR
d. NOUN 15 ENTR
e. 00006 ENTR ENTR
f. 05013 ENTR ENTR
g. 04511 ENTR ENTR
h. 40000 ENTR ENTR
i. 31312 ENTR ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

T5/T6 RUPT TEST

32. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
j. 54030 ENTR ENTR k. 31313 ENTR ENTR l. 54345 ENTR ENTR m. 04353 ENTR ENTR n. 36027 ENTR ENTR o. 01314 ENTR ENTR p1. 00006 ENTR ENTR p2. 22012 ENTR ENTR p3. 22016 ENTR ENTR p4. 04572 ENTR ENTR q. 00011 ENTR ENTR r. 01300 ENTR s. VERB 25 NOUN 26 ENTR t. 01000 ENTR u. 01305 ENTR v. 00002 ENTR w. VERB 21 NOUN 01 ENTR x. 00031 ENTR y. 37777 ENTR z. VERB 11 NOUN 01 ENTR aa. 00031 ENTR NOTE: DSKY key entries made during steps 32 through 39 may cause the KEY REL indicator to flash.	
33. Press to light MONITOR pushbutton on Programmer and Monitor panel. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.	33. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.
34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RG display does not indicate 34055.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
35. Enter VERB 30 and press ENTR pushbutton on the DSKY.	35. Press EXECUTE pushbutton on Programmer and Monitor panel.
36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.	36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.
37. Perform following DSKY operations: a. VERB 36 ENTR b. VERB 21 NOUN 01 ENTR c. 00031 ENTR d. 40000 ENTR e. VERB 11 NOUN 01 ENTR f. 00031 ENTR	37. Press EXECUTE pushbutton on Programmer and Monitor panel.
38. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	38. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.
39. Enter VERB 30 and press ENTR pushbutton on the DSKY.	39. Press EXECUTE pushbutton on Programmer and Monitor panel.
40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.	40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.
41. Enter VERB 36 and press ENTR pushbutton on the DSKY.	41. Press EXECUTE pushbutton on Programmer and Monitor panel.
RADAR RUPT TEST	RADAR RUPT TEST
42. Perform following DSKY operations: a. VERB 24 NOUN 01 ENTR b. 01303 ENTR c. 04353 ENTR d. 00010 ENTR e. VERB 22 NOUN 26 ENTR f. 01300 ENTR	42. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.
44. Enter VERB 30 and press ENTR pushbutton on the DSKY.	44. Press EXECUTE pushbutton on Programmer and Monitor panel.
45. Verify that RZ display on Programmer and Monitor panel indicates 4046.	45. Verify that RG display indicates 34062.
T10 RUPT TEST	T10 RUPT TEST
46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.	46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.
47. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 04000 ENTR d. VERB 30 ENTR	47. Press EXECUTE pushbutton on Programmer and Monitor panel.
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.
51. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	51. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
52. Enter VERB 30 and press ENTR pushbutton on the DSKY.	52. Press EXECUTE pushbutton on Programmer and Monitor panel.
53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that	53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.
55. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	55. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
56. Enter VERB 30 and press ENTR pushbutton on the DSKY.	56. Press EXECUTE pushbutton on Programmer and Monitor panel.
57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.
59. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	59. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
60. Enter VERB 30 and press ENTR pushbutton on the DSKY.	60. Press EXECUTE pushbutton on Programmer and Monitor panel.
61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.
63. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	63. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
64. Enter VERB 30 and press ENTR pushbutton on the DSKY.	64. Press EXECUTE pushbutton on Programmer and Monitor panel.
65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that	65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.
67. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	67. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
68. Enter VERB 30 and press ENTR pushbutton on the DSKY.	68. Press EXECUTE pushbutton on Programmer and Monitor panel.
69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.
71. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	71. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
72. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	72. Press EXECUTE pushbutton on Programmer and Monitor panel.
73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.
75. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	75. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
76. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	76. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.
79. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	79. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
80. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	80. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.
83. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	83. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
84. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	84. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.
87. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	87. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	88. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.
91. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	91. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
92. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	92. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.
95. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
96. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	96. Press EXECUTE pushbutton on Programmer and Monitor panel.
97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display indicates 0.	97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and monitor panel does not indicate 34063.
100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
101. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	101. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on	102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display

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SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	indicates 34063. Release Attitude Impulse Hand Controller.
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
105. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	105. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

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SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counter-clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counter-clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
109. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	109. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
110. Enter VERB 36 and press ENTR pushbutton on DSKY.	110. Press EXECUTE pushbutton on Programmer and Monitor panel.
IRIG AND PIPA TEST INITIALIZATION	IRIG AND PIPA TEST INITIALIZATION
111. Press ISS OPERATE pushbutton on Test Control panel.	111. Press ISS OPERATE pushbutton on Test Control panel.
112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.	112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.
113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.	113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.
CGC SELF CHECK	CGC SELF CHECK
114. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 00010 ENTR	114. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and monitor panel. 114A. When VERB 21 NOUN 27 flashes on the DSKY, press EXECUTE pushbutton on

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV T PAGE 23 OF 25

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	Programmer and Monitor panel.
Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.	Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.
IRIG AND PIPA TEST (Nominal Voltage)	IRIG AND PIPA TEST (Nominal Voltage)
115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.	115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.
116. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. Observe: NO ATT lamp lights momentarily and then goes out f. VERB 34 ENTR	116. Press EXECUTE pushbutton on Programmer and Monitor panel. 116A. When VERB 21 NOUN 01 flashes on the DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 116B. When VERB 16 NOUN 20 is displayed on the DSKY, observe that the NO ATT lamp lights momentarily and then goes out. 116C. Press EXECUTE pushbutton on Programmer and Monitor panel.
117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.	117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.
118. Enter VERB 33 and press ENTR pushbutton on the DSKY.	118. Press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.	119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.
IRIG AND PIPA TEST (Low Voltage)	IRIG AND PIPA TEST (Low Voltage)
120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.
121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.	121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.
122. Enter VERB 36 and press ENTR pushbutton on the DSKY.	122. Press EXECUTE pushbutton on Programmer and Monitor panel.
123. Repeat steps 114 through 119.	123. Repeat steps 114 through 119.
IRIG AND PIPA TEST (High Voltage)	IRIG AND PIPA TEST (High Voltage)
124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.
125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, -0.25) vdc. Record indication.	125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, -0.25) vdc. Record indication.
126. Enter VERB 36 and press ENTR pushbutton on the DSKY.	126. Press EXECUTE pushbutton on Programmer and Monitor panel.
127. Repeat steps 114 through 119.	127. Repeat steps 114 through 119.
128. Enter VERB 36 and press ENTR pushbutton on the DSKY.	128. Press EXECUTE pushbutton on Programmer and Monitor panel.
129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

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SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

CTS UPLINK TAPE LOAD PROCEDURES

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

132. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

133. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

134. Set AGREEMENT B switch on Logic Drawer No. 2 to OFF and then set AGREEMENT B digitswitches to XXXXXXXX.

135. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

136. Rewind and remove tape from Tape Reader and set Power switch to OFF. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12206
REV. T
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 111	Displays	All DSKY character and condition lamps performed as required						
113	CGC 28 vdc Bus	vdc	28.50		29.10			a
114	Self Test Failures	▨	▨		▨			
117	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
119	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			c
	Self Test Failures	▨	▨		▨			
121	CGC 28 vdc Bus	vdc	25.80		26.05			d
123 (114)	Self Test Failures	▨	▨		▨			
123 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
123 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			f
	Self Test Failures	▨	▨		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12206
REV. T

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
125	CGC 28 vdc Bus	vdc	31.55		31.8			g
127 (114)	Self Test Failures	▨	▨		▨			
127 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			h
127 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			i
	Self Test Failures	▨	▨		▨			
131	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
131	line j = line b - line e = ______ line k = (line c - line f) x 10^3 = ______ line l = line b - line h = ______ line m = (line c - line i) x 10^3 = ______

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12206
REV. T

JOB G & N SYSTEM OPERATIONAL TEST

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table I

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. U PAGE 1 OF 30
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-
H	3-9-67	33188	1-5	All	EA	-
J	7-20-67	34177	1	-	SB	-
K	11-9-67	35022	3,6,7	2	EA	-
L	1-4-68	35353	2,3,6	All	EA	-
M	5-29-68	36278	All	All	EA	-
N	8-26-68	36714	7-10, 13	1,2	EA JF	-
P	1-28-69	37270	1,3,10	-	EA	-
R	3-11-69	37401	1,4,8,25	-	EA	-
S	3-27-69	37449	1, 13	-	EA	-
T	8-11-69	37744	2	-	EA	-
U	5-26-70	38117	1,2,25-30	2	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL JDC 12206 CTS UPLINK Tape, P/N 2901626-001

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM 01-3A
Chg. 3-18-66

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV U PAGE 2 OF 30

SUBSYSTEM G & N SYSTEM | ASSY

3. When only one DSKY is available for testing, the following conditions will occur in steps 12, 16, 20, 24, 26A, and 28:
   a. With DSKY in NAV DSKY location, the G&N Caution lamp on the Monitor Panel will not light as specified.
   b. With DSKY in MAIN DSKY location, the PGNS lamp on the Indicator Control Panel will not light as specified.

INITIALIZATION

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate Power is applied.

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike cradle locking handles.

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: 1. Insure steps 2 through 30 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 30 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 30 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 115.

3. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP

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SUBSYSTEM G & N SYSTEM | ASSY

ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHT-WATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM CTS P/N
ALARMS #18 - E-MEMORY PARITY FAIL 2014042-071 only

2. Perform following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 21	NOUN 27	ENTR
c.	00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable character electroluminescent elements and all pushbutton electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's

k. Minus signs in Row 1, Row 2, and Row 3
l. VERB-NOUN Flashing
m. COMP ACTY
} on concurrently for approx. 5 seconds

n. Plus signs in Row 1, Row 2, and Row 3
o. VERB-NOUN Flashing
p. COMP ACTY
} on concurrently for approx. 5 seconds

q. COMP ACTY ______ on for approx. 5 seconds, then DSKY blanks

NOTE: Insure that CONDITION LAMPS switch on Indicator Control panel is set to ON.

4. Enter VERB 35 and press ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds:

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEL REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
} on concurrently for approx. 5 seconds

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JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV U PAGE 4 OF 30

SUBSYSTEM G & N SYSTEM | ASSY

k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
} on concurrently for approx. 5 seconds
m. Plus 88888 in Row 1, Row 2, and Row 3
} (CMC remains on 10 to 20 seconds after other lamps go out)

After indications a through l go out, plus 88888's shall remain on Row 1, Row 2, and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe:		
	VERB 24	NOUN 01	Flashing
c.	01700		ENTR
d.	Observe:		
	VERB 21	NOUN 01	Flashing
e.	+12345		ENTR
f.	Observe:		
	VERB 22	NOUN 01	Flashing
g.	-67890	Do NOT press ENTR	

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 NOUN 01 continue flashing.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedure in this JDC.

3. Insure that UP TELEMETRY switch on Indicator Control panel is set to ACCEPT when performing the CTS UPLINK TAPE LOAD PROCEDURES.

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MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

(B) Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(C) Logic Drawer No. 2 - Set AGREEMENT B digit-switches to X01X3070. Set AGREEMENT B switch to STOP.

(D) RDC Interface panel - Press to light CH33-10 pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on

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MANUAL LOAD PROCEDURES

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

(E) Tape Reader (cont) - Programmer and Monitor panel and press RSET pushbutton on DSKY.

(F) Programmer and Monitor panel - Press EXECUTE pushbutton.

(G) Verify that tape advances to beginning of first UPLINK code.

(H) Programmer and Monitor panel - Press EXECUTE pushbutton.

(I) Verify that AGREEMENT B lamp on Logic Drawer NO. 2 is not lighted.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that DSKY blanks except PROG indicates 00.

MANUAL LOAD PROCEDURES

j. 01000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR
n. Observe:

DSKY blanks except PROG indicates 00.

9. Enter VERB 27 NOUN 01 and press ENTR pushbutton on the DSKY.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Enter 70000 and press ENTR pushbutton on the DSKY.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press the RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Enter VERB 36 and press ENTR pushbutton on the DSKY. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

CTS UPLINK TAPE LOAD PROCEDURES

9. Press EXECUTE pushbutton on Programmer and Monitor panel.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

MANUAL LOAD PROCEDURES

RUPT LOCK

16. Perform following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 01600 ENTR
c. 00004 ENTR
d. 30067 ENTR
e. 01601 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01600 ENTR
i. 00003 ENTR
j. VERB 31 ENTR

Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Enter VERB 36 and press ENTR pushbutton on the DSKY.

19. Perform following DSKY operations:

a. VERB 21 NOUN 26 ENTR
b. 01000 ENTR
c. VERB 30 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

RUPT LOCK

16. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Press EXECUTE pushbutton on Programmer and Monitor panel.

19. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

22. Enter VERB 36 and press ENTR pushbutton on the DSKY.

TC TRAP TEST

23. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01600 ENTR
c. 01660 ENTR
d. VERB 30 ENTR

24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

CTS UPLINK TAPE LOAD PROCEDURES

20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

22. Press EXECUTE pushbutton on Programmer and Monitor panel.

TC TRAP TEST

23. Press EXECUTE pushbutton on Programmer and Monitor panel.

24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

MANUAL LOAD PROCEDURES

25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 02 ENTR
c. 01600 ENTR
d. 30067 ENTR
e. NOUN 15 ENTR
f. 31604 ENTR ENTR
g. 22000 ENTR ENTR
h. 22005 ENTR ENTR
i. 01600 ENTR
j. VERB 30 ENTR

26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed, and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26C. Enter VERB 36 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.

26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 of the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.

26C. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

NIGHT WATCHMAN TEST

27. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. 01600 ENTR
c. 30001 ENTR
d. 01600 ENTR
e. VERB 30 ENTR

28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.

29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

30. Enter VERB 36 and press ENTR pushbutton on the DSKY.

SECOND DSKY CHECK

NOTE: Disregard step 31 if only one DSKY is used in system under test.

31. Repeat steps 2 through 30 for the second DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

NIGHT WATCHMAN TEST

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.

29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

30. Press EXECUTE pushbutton on Programmer and Monitor panel.

SECOND DSKY CHECK

NOTE: Disregard step 31 if only one DSKY is used in system under test.

31. Repeat steps 2 through 30 for the second DSKY. Reload the UPLINK Tape in the Tape Reader at the beginning of the tape.

MANUAL LOAD PROCEDURES

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

T5/T6 RUPT TEST

32. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 31304 ENTR
d. NOUN 15 ENTR
e. 00006 ENTR ENTR
f. 05013 ENTR ENTR
g. 04511 ENTR ENTR
h. 40000 ENTR ENTR
i. 31312 ENTR ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.

T5/T6 RUPT TEST

32. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
j. 54030 ENTR ENTR k. 31313 ENTR ENTR l. 54345 ENTR ENTR m. 04353 ENTR ENTR n. 36027 ENTR ENTR o. 01314 ENTR ENTR p1. 00006 ENTR ENTR p2. 22012 ENTR ENTR p3. 22016 ENTR ENTR p4. 04572 ENTR ENTR q. 00011 ENTR ENTR r. 01300 ENTR s. VERB 25 NOUN 26 ENTR t. 01000 ENTR u. 01305 ENTR v. 00002 ENTR w. VERB 21 NOUN 01 ENTR x. 00031 ENTR y. 37777 ENTR z. VERB 11 NOUN 01 ENTR aa. 00031 ENTR NOTE: DSKY key entries made during steps 32 through 39 may cause the KEY REL indicator to flash.	
33. Press to light MONITOR pushbutton on Programmer and Monitor panel. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.	33. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.
34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RG display does not indicate 34055.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
35. Enter VERB 30 and press ENTR pushbutton on the DSKY.	35. Press EXECUTE pushbutton on Programmer and Monitor panel.
36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.	36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.
37. Perform following DSKY operations: a. VERB 36 ENTR b. VERB 21 NOUN 01 ENTR c. 00031 ENTR d. 40000 ENTR e. VERB 11 NOUN 01 ENTR f. 00031 ENTR	37. Press EXECUTE pushbutton on Programmer and Monitor panel.
38. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	38. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.
39. Enter VERB 30 and press ENTR pushbutton on the DSKY.	39. Press EXECUTE pushbutton on Programmer and Monitor panel.
40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.	40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.
41. Enter VERB 36 and press ENTR pushbutton on the DSKY.	41. Press EXECUTE pushbutton on Programmer and Monitor panel.
RADAR RUPT TEST	RADAR RUPT TEST
42. Perform following DSKY operations: a. VERB 24 NOUN 01 ENTR b. 01303 ENTR c. 04353 ENTR d. 00010 ENTR e. VERB 22 NOUN 26 ENTR f. 01300 ENTR	42. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.
44. Enter VERB 30 and press ENTR pushbutton on the DSKY.	44. Press EXECUTE pushbutton on Programmer and Monitor panel.
45. Verify that RZ display on Programmer and Monitor panel indicates 4046.	45. Verify that RG display indicates 34062.
T10 RUPT TEST	T10 RUPT TEST
46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.	46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.
47. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 04000 ENTR d. VERB 30 ENTR	47. Press EXECUTE pushbutton on Programmer and Monitor panel.
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.
51. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	51. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
52. Enter VERB 3 and press ENTR pushbutton on the DSKY.	52. Press EXECUTE pushbutton on Programmer and Monitor panel.
53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that	53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.
55. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	55. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
56. Enter VERB 30 and press ENTR pushbutton on the DSKY.	56. Press EXECUTE pushbutton on Programmer and Monitor panel.
57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.
59. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	59. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
60. Enter VERB 30 and press ENTR pushbutton on the DSKY.	60. Press EXECUTE pushbutton on Programmer and Monitor panel.
61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.
63. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	63. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
64. Enter VERB 30 and press ENTR pushbutton on the DSKY.	64. Press EXECUTE pushbutton on Programmer and Monitor panel.
65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that	65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.
67. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	67. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
68. Enter VERB 30 and press ENTR pushbutton on the DSKY.	68. Press EXECUTE pushbutton on Programmer and Monitor panel.
69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.
71. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	71. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
72. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	72. Press EXECUTE pushbutton on Programmer and Monitor panel.
73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.
75. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	75. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
76. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	76. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.
79. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	79. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
80. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	80. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.
83. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	83. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
84. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	84. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.
87. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	87. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	88. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.
91. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	91. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
92. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	92. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.
95. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
96. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	96. Press EXECUTE pushbutton on Programmer and Monitor panel.
97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display indicates 0.	97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

SUBSYSTEM G & N SYSTEM ASSY

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and monitor panel does not indicate 34063.
100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
101. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	101. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on	102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	indicates 34063. Release Attitude Impulse Hand Controller.
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
105. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	105. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
109. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	109. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
110. Enter VERB 36 and press ENTR pushbutton on DSKY.	110. Press EXECUTE pushbutton on Programmer and Monitor panel.
IRIG AND PIPA TEST INITIALIZATION	IRIG AND PIPA TEST INITIALIZATION
111. Press ISS OPERATE pushbutton on Test Control panel.	111. Press ISS OPERATE pushbutton on Test Control panel.
112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.	112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.
113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.	113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.
CGC SELF CHECK	CGC SELF CHECK
114. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 00010 ENTR	114. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and monitor panel. 114A. When VERB 21 NOUN 27 flashes on the DSKY, press EXECUTE pushbutton on

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.	Programmer and Monitor panel. Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.
IRIG AND PIPA TEST (Nominal Voltage)	IRIG AND PIPA TEST (Nominal Voltage)
115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.	115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.
116. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. Observe: NO ATT lamp lights momentarily and then goes out f. VERB 34 ENTR	116. Press EXECUTE pushbutton on Programmer and Monitor panel. 116A. When VERB 21 NOUN 01 flashes on the DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 116B. When VERB 16 NOUN 20 is displayed on the DSKY, observe that the NO ATT lamp lights momentarily and then goes out. 116C. Press EXECUTE pushbutton on Programmer and Monitor panel.
117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.	117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.
118. Enter VERB 33 and press ENTR pushbutton on the DSKY.	118. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.	119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.
IRIG AND PIPA TEST (Low Voltage)	IRIG AND PIPA TEST (Low Voltage)
120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.
121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, −0) vdc. Record indication.	121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, −0) vdc. Record indication.
122. Enter VERB 36 and press ENTR pushbutton on the DSKY.	122. Press EXECUTE pushbutton on Programmer and Monitor panel.
123. Repeat steps 114 through 119.	123. Repeat steps 114 through 119.
IRIG AND PIPA TEST (High Voltage)	IRIG AND PIPA TEST (High Voltage)
124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.
125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, −0.25) vdc. Record indication.	125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, −0.25) vdc. Record indication.
126. Enter VERB 36 and press ENTR pushbutton on the DSKY.	126. Press EXECUTE pushbutton on Programmer and Monitor panel.
127. Repeat steps 114 through 119.	127. Repeat steps 114 through 119.
128. Enter VERB 36 and press ENTR pushbutton on the DSKY.	128. Press EXECUTE pushbutton on Programmer and Monitor panel.
129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

MANUAL LOAD PROCEDURES

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

CTS UPLINK TAPE LOAD PROCEDURES

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

132. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

133. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

134. Set AGREEMENT B switch on Logic Drawer No. 2 to OFF and then set AGREEMENT B digitswitches to XXXXXXXX.

135. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

136. Rewind and remove tape from Tape Reader and set Power switch to OFF. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

NOTE: The remaining procedures of this JDC apply only if Restart Monitor module (2898989) is installed.

137. Downmode the system to OIA on mode according to procedure given in JDC 12204.

138. Remove W226-P1 from CGC test connector.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

CAUTION: Observe marking on Restart Monitor module and insure proper keying when installing.

139. Install Restart Monitor module on CGC test connector as follows:

a. Carefully locate module on guide pins of CGC connector maintaining parallelism between module and test connector as closely as possible and engage the four (4) corner jackscrews until finger tight.

b. To fully engage module to computer, turn each jackscrew one-fourth (1/4) turn at a time moving around the module in sequence. When fully engaged, torque each jackscrew to 19 ± 1 in-lb.

140. Advance system to ISS STANDBY mode according to the procedure given in JDC 12204.

141. Perform the following DSKY operations:

a. VERB 27 NOUN 01 ENTR
b. 07700 ENTR
c. Observe that RESTART lamp on the DSKY lights.
d. VERB 01 NOUN 10 ENTR
e. 00077 ENTR
f. The contents of Row 1 on the DSKY shall be 00001 or 00101.

142. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

c. 00000 ENTR
d. Press RSET pushbutton.

143. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 31304 ENTR
d. NOUN 15 ENTR
e. 54067 ENTR ENTR
f. 31305 ENTR ENTR
g. 54001 ENTR ENTR
h. 14613 ENTR ENTR
i. 00067 ENTR
j. VERB 25 NOUN 26 ENTR
k. 00001 ENTR
l. 01300 ENTR
m. 00000 ENTR
n. VERB 31 ENTR
o. Observe that RESTART lamp on DSKY lights.
p. VERB 01 NOUN 10 ENTR
q. 00077 ENTR
r. The contents of Row 1 on the DSKY shall be 00004 or 00104.

144. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

145. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 01300 ENTR
c. 00004 ENTR
d. 30067 ENTR
e. 01300 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01300 ENTR
i. 00000 ENTR
j. VERB 31 ENTR
k. Observe that the RESTART lamp on DSKY lights.
l. VERB 01 NOUN 10 ENTR
m. 00077 ENTR
n. The contents of Row 1 on the DSKY shall be 00010 or 00110.

146. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

147. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 30000 ENTR
d. NOUN 15 ENTR
e. 01300 ENTR

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

f. VERB 25 NOUN 26 ENTR
g. 02000 ENTR
h. 01300 ENTR
i. 00000 ENTR
j. VERB 30 ENTR
k. Observe that the RESTART lamp on the DSKY lights in approximately 2 seconds.
l. VERB 01 NOUN 10 ENTR
m. 00077 ENTR
n. The contents of Row 1 on the DSKY shall be 00020 or 00120.

148. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:
a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

149. Set Crossbar Control on OIA to 175 to monitor +28 VDC on the DVM.

150. Using the G&N POWER ADJUST control on the TEST CONTROL panel, slowly decrease the +28 VDC until the RESTART lamp on the DSKY lights. Return the +28 VDC to 28.0 ± 0.25 VDC.

151. Perform the following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 on the DSKY shall be 00XAX, where A can be 4, 5, 6 or 7 due to multiple failures.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

152. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:
a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

153. Record compliance of DSKY displays for steps 141, 143, 145, 147 and 151.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12206
REV. U
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 111	Displays	All DSKY character and condition lamps performed as required						
113	CGC 28 vdc Bus	vdc	28.50		29.10			a
114	Self Test Failures	▨	▨		▨			
117	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
119	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			c
	Self Test Failures	▨	▨		▨			
121	CGC 28 vdc Bus	vdc	25.80		26.05			d
123 (114)	Self Test Failures	▨	▨		▨			
123 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
123 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			f
	Self Test Failures	▨	▨		▨			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12206
REV. U

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
125	CGC 28 vdc Bus	vdc	31.55		31.8			g
127 (114)	Self Test Failures	▨	▨		▨			
127 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			h
127 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			i
	Self Test Failures	▨	▨		▨			
131	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m
153	Displays			All DSKY characters and lamps performed as required.				

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 3

JDC
NO. 12206
REV. U

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	CALCULATIONS
131	line j = line b - line e = ____________ line k = (line c - line f) x 10^3 = ____________ line l = line b - line h = ____________ line m = (line c - line i) x 10^3 = ____________

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table I

DATE 30 JUN 66

FORM 60 48
Chg. 7-2 -65

JOB G & N SYSTEM OPERATIONAL TEST | JDC 12206 REV. V PAGE 1 OF 29
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30302	3,5	1	EA	WS
B	9-1-66	30923	5	-	JP	-
C	9-1-66	30930	5,6	-	JP	-
D	10-20-66	31613	1	-	EA	-
E	10-27-66	31724	1,5	-	EA	-
F	11-15-66	31940	3	All	EA	-
G	2-2-67	32880	3,6	1	EA	-
H	3-9-67	33188	1-5	All	EA	-
J	7-20-67	34177	1	-	SB	-
K	11-9-67	35022	3,6,7	2	EA	-
L	1-4-68	35353	2,3,6	All	EA BD	-
M	5-29-68	36278	All	All	EA BD	-
N	8-26-68	36714	7-10, 13	1,2	EA JF	-
P	1-28-69	37270	1,3,10	-	EA	-
R	3-11-69	37401	1,4,8,25	-	EA BD	-
S	3-27-69	37449	1, 13	-	EA	-
T	8-11-69	37744	2	-	EA	-
U	5-26-70	38117	1,2,25-30	2	EA	-
V	9-4-70	38201	29	2	JS JF	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL JDC 12206 CTS UPLINK Tape, P/N 2901626-0(4

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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3. When only one DSKY is available for testing, the following conditions will occur in steps 12, 16, 20, 24, 26A, and 28:
   a. With DSKY in NAV DSKY location, the G&N Caution lamp on the Monitor Panel will not light as specified.
   b. With DSKY in MAIN DSKY location, the PGNS lamp on the Indicator Control Panel will not light as specified.

INITIALIZATION

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate Power is applied.

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike cradle locking handles.

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

DSKY CHECK

NOTE: 1. Insure steps 2 through 30 are performed for both MAIN DSKY and NAV DSKY except when only one DSKY is available for test. When only one DSKY is available, test may be continued after steps 2 through 30 are performed with the one DSKY in the NAV DSKY location and then repeating steps 8 through 30 with the DSKY in the MAIN DSKY location. Before changing DSKY locations, downmode the system to OIA ON mode according to procedures given in JDC 12204.

2. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 115.

3. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP

ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHT-WATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM
ALARMS #18 - E-MEMORY PARITY FAIL

CTS P/N 2014042-071 only

2. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 27 ENTR
c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable character electroluminescent elements and all pushbutton electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2, and Row 3
l. VERB-NOUN Flashing
m. COMP ACTY

} on concurrently for approx. 5 seconds

n. Plus signs in Row 1, Row 2, and Row 3
o. VERB-NOUN Flashing
p. COMP ACTY

} on concurrently for approx. 5 seconds

q. COMP ACTY ______ on for approx. 5 seconds, then DSKY blanks

NOTE: Insure that CONDITION LAMPS switch on Indicator Control panel is set to ON.

4. Enter VERB 35 and press ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds:

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEL REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing

} on concurrently for approx. 5 seconds

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k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2, and Row 3

} on concurrently for approx. 5 seconds (CMC remains on 10 to 20 seconds after other lamps go out)

After indications a through l go out, plus 88888's shall remain on Row 1, Row 2, and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe:
VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe:
VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe:
VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 NOUN 01 continue flashing.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedure in this JDC.

3. Insure that UP TELEMETRY switch on Indicator Control panel is set to ACCEPT when performing the CTS UPLINK TAPE LOAD PROCEDURES.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

(B) Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(C) Logic Drawer No. 2 - Set AGREEMENT B digit-switches to X01X3C70. Set AGREEMENT B switch to STOP.

(D) RDC Interface panel - Press to light CH33-10 pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on

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MANUAL LOAD PROCEDURES

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

(E) Tape Reader (cont) - Programmer and Monitor panel and press RSET pushbutton on DSKY.

(F) Programmer and Monitor panel - Press EXECUTE pushbutton.

(G) Verify that tape advances to beginning of first UPLINK code.

(H) Programmer and Monitor panel - Press EXECUTE pushbutton.

(I) Verify that AGREEMENT B lamp on Logic Drawer NO. 2 is not lighted.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Press EXECUTE pushbutton on Programmer and Monitor panel.
Observe that DSKY blanks except PROG indicates 00.

MANUAL LOAD PROCEDURES

j. 01000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR
n. Observe:
DSKY blanks except PROG indicates 00.

9. Enter VERB 27 NOUN 01 and press ENTR pushbutton on the DSKY.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Enter 70000 and press ENTR pushbutton on the DSKY.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press the RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Enter VERB 36 and press ENTR pushbutton on the DSKY. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

CTS UPLINK TAPE LOAD PROCEDURES

9. Press EXECUTE pushbutton on Programmer and Monitor panel.

10. Observe that VERB 27 NOUN 01 flash on the DSKY.

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

12. Verify that the RESTART condition lamp on the DSKY, PGNS lamp on the Indicator Control panel, and PARITY FAIL lamp on Logic Drawer No. 2 of CTS are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

13. Press RSET pushbutton on the DSKY. The RESTART, PGNS, and G/N CAUTION lamps shall go out.

14. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

15. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that the DSKY blanks except the PROG lamp which shall indicate 00.

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RUPT LOCK

16. Perform following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 01600 ENTR
c. 00004 ENTR
d. 30067 ENTR
e. 01601 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01600 ENTR
i. 00003 ENTR
j. VERB 31 ENTR

Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Enter VERB 36 and press ENTR pushbutton on the DSKY.

19. Perform following DSKY operations:

a. VERB 21 NOUN 26 ENTR
b. 01000 ENTR
c. VERB 30 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

RUPT LOCK

16. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

17. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

18. Press EXECUTE pushbutton on Programmer and Monitor panel.

19. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.	20. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 1 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.
21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	21. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
22. Enter VERB 36 and press ENTR pushbutton on the DSKY.	22. Press EXECUTE pushbutton on Programmer and Monitor panel.
TC TRAP TEST	TC TRAP TEST
23. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01600 ENTR c. 01600 ENTR d. VERB 30 ENTR	23. Press EXECUTE pushbutton on Programmer and Monitor panel.
24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.	24. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on the Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.	25. Press the RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.
26. Perform following DSKY operations: a. VERB 36 ENTR b. VERB 21 NOUN 02 ENTR c. 01600 ENTR d. 30067 ENTR e. NOUN 15 ENTR f. 31604 ENTR ENTR g. 22000 ENTR ENTR h. 22005 ENTR ENTR i. 01600 ENTR j. VERB 30 ENTR	26. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.
26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed, and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.	26A. Verify that RESTART condition lamp on DSKY and PGNS lamp on Indicator Control panel are lighted. The G/N CAUTION lamp on Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 of the DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may light.
26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.	26B. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel of the CTS. All CTS alarm indications shall go out.
26C. Enter VERB 36 and press ENTR pushbutton on DSKY.	26C. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NIGHT WATCHMAN TEST	NIGHT WATCHMAN TEST
27. Perform following DSKY operations: a. VERB 24 NOUN 01 ENTR b. 01600 ENTR c. 30001 ENTR d. 01600 ENTR e. VERB 30 ENTR	27. Press EXECUTE pushbutton on Programmer and Monitor panel.
28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.	28. Verify that the RESTART condition lamp on the DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 of the CTS shall be lighted. AGC ALARMS lamp 2 may also light.
29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	29. Press RSET pushbutton on the DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
30. Enter VERB 36 and press ENTR pushbutton on the DSKY.	30. Press EXECUTE pushbutton on Programmer and Monitor panel.
SECOND DSKY CHECK	SECOND DSKY CHECK
NOTE: Disregard step 31 if only one DSKY is used in system under test.	NOTE: Disregard step 31 if only one DSKY is used in system under test.
31. Repeat steps 2 through 30 for the second DSKY.	31. Repeat steps 2 through 30 for the second DSKY. Reload the UPLINK Tape in the Tape Reader at the beginning of the tape.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV. DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.	NOTE: If two DSKY's are available for testing, one DSKY may be removed from the system configuration after completion of step 31 if desired but the remaining DSKY must be placed in the NAV. DSKY location for the remainder of the test. If only one DSKY is available for testing, that DSKY must be placed in the NAV DSKY location for the remainder of the test. Before removing a DSKY or changing DSKY locations, downmode the system to the OIA ON mode according to procedures given in JDC 12204.
T5/T6 RUPT TEST	T5/T6 RUPT TEST
32. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01300 ENTR c. 31304 ENTR d. NOUN 15 ENTR e. 00006 ENTR ENTR f. 05013 ENTR ENTR g. 04511 ENTR ENTR h. 40000 ENTR ENTR i. 31312 ENTR ENTR	32. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
j. 54030 ENTR ENTR	
k. 31313 ENTR ENTR	
l. 54345 ENTR ENTR	
m. 04353 ENTR ENTR	
n. 36027 ENTR ENTR	
o. 01314 ENTR ENTR	
p1. 00006 ENTR ENTR	
p2. 22012 ENTR ENTR	
p3. 22016 ENTR ENTR	
p4. 04572 ENTR ENTR	
q. 00011 ENTR ENTR	
r. 01300 ENTR	
s. VERB 25 NOUN 26 ENTR	
t. 01000 ENTR	
u. 01305 ENTR	
v. 00002 ENTR	
w. VERB 21 NOUN 01 ENTR	
x. 00031 ENTR	
y. 37777 ENTR	
z. VERB 11 NOUN 01 ENTR	
aa. 00031 ENTR	
NOTE: DSKY key entries made during steps 32 through 39 may cause the KEY REL indicator to flash.	
33. Press to light MONITOR pushbutton on Programmer and Monitor panel. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.	33. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.
34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	34. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RG display does not indicate 34055.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
35. Enter VERB 30 and press ENTR pushbutton on the DSKY.	35. Press EXECUTE pushbutton on Programmer and Monitor panel.
36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.	36. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.
37. Perform following DSKY operations:	37. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 36 ENTR	
b. VERB 21 NOUN 01 ENTR	
c. 00031 ENTR	
d. 40000 ENTR	
e. VERB 11 NOUN 01 ENTR	
f. 00031 ENTR	
38. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	38. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.
39. Enter VERB 30 and press ENTR pushbutton on the DSKY.	39. Press EXECUTE pushbutton on Programmer and Monitor panel.
40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.	40. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11; Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.
41. Enter VERB 36 and press ENTR pushbutton on the DSKY.	41. Press EXECUTE pushbutton on Programmer and Monitor panel.
RADAR RUPT TEST	RADAR RUPT TEST
42. Perform following DSKY operations:	42. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24 NOUN 01 ENTR	
b. 01303 ENTR	
c. 04353 ENTR	
d. 00010 ENTR	
e. VERB 22 NOUN 26 ENTR	
f. 01300 ENTR	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.
44. Enter VERB 30 and press ENTR pushbutton on the DSKY.	44. Press EXECUTE pushbutton on Programmer and Monitor panel.
45. Verify that RZ display on Programmer and Monitor panel indicates 4046.	45. Verify that RG display indicates 34062.
T10 RUPT TEST	T10 RUPT TEST
46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.	46. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4051.
47. Perform following DSKY operations:	47. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 01 ENTR	
b. 01304 ENTR	
c. 04000 ENTR	
d. VERB 30 ENTR	
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	49. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	50. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.
51. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	51. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
52. Enter VERB 30 and press ENTR pushbutton on the DSKY.	52. Press EXECUTE pushbutton on Programmer and Monitor panel.
53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that	53. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	54. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.
55. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	55. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
56. Enter VERB 30 and press ENTR pushbutton on the DSKY.	56. Press EXECUTE pushbutton on Programmer and Monitor panel.
57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	57. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	58. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.
59. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	59. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
60. Enter VERB 30 and press ENTR pushbutton on the DSKY.	60. Press EXECUTE pushbutton on Programmer and Monitor panel.
61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	61. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	62. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.
63. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	63. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
64. Enter VERB 30 and press ENTR pushbutton on the DSKY.	64. Press EXECUTE pushbutton on Programmer and Monitor panel.
65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that	65. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
RZ display on Programmer and Monitor panel indicates 4052.	RG display on Programmer and Monitor panel indicates 34063.
66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	66. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.
67. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	67. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
68. Enter VERB 30 and press ENTR pushbutton on the DSKY.	68. Press EXECUTE pushbutton on Programmer and Monitor panel.
69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	69. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	70. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.
71. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	71. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
72. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	72. Press EXECUTE pushbutton on Programmer and Monitor panel.
73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	73. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	74. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.
75. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	75. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
76. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	76. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	77. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	78. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.
79. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	79. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
80. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	80. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	82. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.
83. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	83. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
84. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	84. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	85. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	86. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.
87. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	87. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	88. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	89. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	90. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.
91. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	91. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
92. Enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 0.	92. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 34063.
93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4052.	93. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 34063.
94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	94. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.
95. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.
96. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	96. Press EXECUTE pushbutton on Programmer and Monitor panel.
97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display indicates 0.	97. Momentarily move Attitude Impulse Hand Controller on Indicator Control panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	98. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Up position. Verify that Row 1 on the DSKY changes from 77777 to 77775. While holding Attitude Impulse Hand Controller in Up position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and monitor panel does not indicate 34063.
100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	100. Hold Attitude Impulse Hand Controller on Indicator Control panel in the Down position. Verify that Row 1 on the DSKY changes from 77777 to 77776. While holding Attitude Impulse Hand Controller in the Down position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
101. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	101. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on	102. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Left position. Verify that Row 1 on the DSKY changes from 77777 to 77737. While holding Attitude Impulse Hand Controller in the Left position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	indicates 34063. Release Attitude Impulse Hand Controller.
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	104. Hold Attitude Impulse Hand Controller on Indicator Control panel to the Right position. Verify that Row 1 on the DSKY changes from 77777 to 77757. While holding Attitude Impulse Hand Controller in the Right position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
105. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	105. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	106. Hold Attitude Impulse Hand Controller on Indicator Control panel to the clockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77773. While holding Attitude Impulse Hand Controller in the clockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, enter VERB 30 and press ENTR pushbutton on the DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4052. Release Attitude Impulse Hand Controller.	108. Hold Attitude Impulse Hand Controller on Indicator Control panel to the counterclockwise position. Verify that Row 1 on the DSKY changes from 77777 to 77767. While holding Attitude Impulse Hand Controller in the counterclockwise position, press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 34063. Release Attitude Impulse Hand Controller.
109. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	109. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display on Programmer and Monitor panel does not indicate 34063.
110. Enter VERB 36 and press ENTR pushbutton on DSKY.	110. Press EXECUTE pushbutton on Programmer and Monitor panel.
IRIG AND PIPA TEST INITIALIZATION	IRIG AND PIPA TEST INITIALIZATION
111. Press ISS OPERATE pushbutton on Test Control panel.	111. Press ISS OPERATE pushbutton on Test Control panel.
112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.	112. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.
113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.	113. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indications.
CGC SELF CHECK	CGC SELF CHECK.
114. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 00010 ENTR	114. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and monitor panel. 114A. When VERB 21 NOUN 27 flashes on the DSKY, press EXECUTE pushbutton on

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	Programmer and Monitor panel.
Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.	Allow the test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that all alarms are out.
IRIG AND PIPA TEST (Nominal Voltage)	IRIG AND PIPA TEST (Nominal Voltage)
115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.	115. Insure that at least 90 seconds have elapsed since performing step 110 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS lamp 6 is out.
116. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. Observe: NO ATT lamp lights momentarily and then goes out f. VERB 34 ENTR	116. Press EXECUTE pushbutton on Programmer and Monitor panel. 116A. When VERB 21 NOUN 01 flashes on the DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 116B. When VERB 16 NOUN 20 is displayed on the DSKY, observe that the NO ATT lamp lights momentarily and then goes out. 116C. Press EXECUTE pushbutton on Programmer and Monitor panel.
117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.	117. In approximately 15 minutes VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications.
118. Enter VERB 33 and press ENTR pushbutton on the DSKY.	118. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.	119. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 NOUN 31 being displayed on the DSKY. If no failure occurs, write "none" on the Data Sheet.
IRIG AND PIPA TEST (Low Voltage)	IRIG AND PIPA TEST (Low Voltage)
120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	120. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.
121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.	121. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.
122. Enter VERB 36 and press ENTR pushbutton on the DSKY.	122. Press EXECUTE pushbutton on Programmer and Monitor panel.
123. Repeat steps 114 through 119.	123. Repeat steps 114 through 119.
IRIG AND PIPA TEST (High Voltage)	IRIG AND PIPA TEST (High Voltage)
124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	124. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.
125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, -0.25) vdc. Record indication.	125. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 31.8 (+0, -0.25) vdc. Record indication.
126. Enter VERB 36 and press ENTR pushbutton on the DSKY.	126. Press EXECUTE pushbutton on Programmer and Monitor panel.
127. Repeat steps 114 through 119.	127. Repeat steps 114 through 119.
128. Enter VERB 36 and press ENTR pushbutton on the DSKY.	128. Press EXECUTE pushbutton on Programmer and Monitor panel.
129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.	129. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on Primary Signal Selector panel to 175.

MANUAL LOAD PROCEDURES

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

CTS UPLINK TAPE LOAD PROCEDURES

130. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.5) vdc.

131. Perform calculations on the calculation sheet.

132. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

133. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

134. Set AGREEMENT B switch on Logic Drawer No. 2 to OFF and then set AGREEMENT B digitswitches to XXXXXXXX.

135. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

136. Rewind and remove tape from Tape Reader and set Power switch to OFF. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

NOTE: The remaining procedures of this JDC apply only if Restart Monitor module (2898989) is installed.

137. Downmode the system to OIA on mode according to procedure given in JDC 12204.

138. Remove W226-P1 from CGC test connector.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

CAUTION: Observe marking on Restart Monitor module and insure proper keying when installing.

139. Install Restart Monitor module on CGC test connector as follows:

a. Carefully locate module on guide pins of CGC connector maintaining parallelism between module and test connector as closely as possible and engage the four (4) corner jackscrews until finger tight.

b. To fully engage module to computer, turn each jackscrew one-fourth (1/4) turn at a time moving around the module in sequence. When fully engaged, torque each jackscrew to 19 ± 1 in-lb.

140. Advance system to ISS STANDBY mode according to the procedure given in JDC 12204.

141. Perform the following DSKY operations:

a. VERB 27 NOUN 01 ENTR
b. 07700 ENTR
c. Observe that RESTART lamp on the DSKY lights.
d. VERB 01 NOUN 10 ENTR
e. 00077 ENTR
f. The contents of Row 1 on the DSKY shall be 00001 or 00101.

142. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

c. 00000 ENTR
d. Press RSET pushbutton.

143. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 31304 ENTR
d. NOUN 15 ENTR
e. 54067 ENTR ENTR
f. 31305 ENTR ENTR
g. 54001 ENTR ENTR
h. 14613 ENTR ENTR
i. 00067 ENTR
j. VERB 25 NOUN 26 ENTR
k. 00001 ENTR
l. 01300 ENTR
m. 00000 ENTR
n. VERB 31 ENTR
o. Observe that RESTART lamp on DSKY lights.
p. VERB 01 NOUN 10 ENTR
q. 00077 ENTR
r. The contents of Row 1 on the DSKY shall be 00004 or 00104.

144. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

145. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 01300 ENTR
c. 00004 ENTR
d. 30067 ENTR
e. 01300 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01300 ENTR
i. 00000 ENTR
j. VERB 31 ENTR
k. Observe that the RESTART lamp on DSKY lights.
l. VERB 01 NOUN 10 ENTR
m. 00077 ENTR
n. The contents of Row 1 on the DSKY shall be 00010 or 00110.

146. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

147. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 30000 ENTR
d. NOUN 15 ENTR
e. 01300 ENTR

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

f. VERB 25 NOUN 26 ENTR
g. 02000 ENTR
h. 01300 ENTR
i. 00000 ENTR
j. VERB 30 ENTR
k. Observe that the RESTART lamp on the DSKY lights in approximately 2 seconds.
l. VERB 01 NOUN 10 ENTR
m. 00077 ENTR
n. The contents of Row 1 on the DSKY shall be 00020 or 00120.

148. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

149. Record compliance of DSKY displays for steps 141, 143, 145, and 147.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12206
REV. V
INITIAL TDRR 29882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ ______ CAL DATE

NAME ____________ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 111	Displays	All DSKY character and condition lamps performed as required						
113	CGC 28 vdc Bus	vdc	28.50		29.10			a
114	Self Test Failures	▨	▨		▨			
117	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			b
119	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			c
	Self Test Failures	▨	▨		▨			
121	CGC 28 vdc Bus	vdc	25.80		26.05			d
123 (114)	Self Test Failures	▨	▨		▨			
123 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			e
123 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			f
	Self Test Failures	▨	▨		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12206
REV. V

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
125	CGC 28 vdc Bus	vdc	31.55		31.8			g
127 (114)	Self Test Failures	▨	▨		▨			
127 (117)	gravity	cm/sec^2	975.0	R1 ______ R2 ______	985.9			h
127 (119)	Horizontal earth rate (R2)	ERU	See Table 1	0. ______	See Table 1			i
	Self Test Failures	▨	▨		▨			
131	Δ gravity (low bus)	cm/sec^2	-1		+1			j
	Δ horizontal earth rate (low bus)	meru	-25		+25			k
	Δ gravity (high bus)	cm/sec^2	-1		+1			l
	Δ horizontal earth rate (high bus)	meru	-25		+25			m
149	Displays ______	______	______	All DSKY characters and lamps performed as required.				

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
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JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	CALCULATIONS
131	line j = line b - line e = ______ line k = (line c - line f) x 10^3 = ______ line l = line b - line h = ______ line m = (line c - line i) x 10^3 = ______

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table I

DATE 30 JUN 66

JOB G & N SYSTEM OPERATIONAL TEST

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INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA measurement should be the value of logal g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA is performed at normal, low and high prime power levels with the CGC Self Check being performed concurrently.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel lighted. Set the Cradle Assembly to the 32.5° position.

MAIN DSKY CHECK

NOTE: Insure step 2 through 18 operations are performed on the MAIN DSKY.

2. Perform the following MAIN DSKY operations:

VERB 21	NOUN 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

JOB G & N SYSTEM OPERATION TEST

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SUBSYSTEM G & N SYSTEM

ASSY

b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2 and Row 3
l. VERB-NOUN Flashing
(k–l: on concurrently for 5 seconds)
m. Plus signs in Row 1, Row 2 and Row 3
n. VERB-NOUN Flashing
(m–n: on concurrently for 5 seconds)

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following MAIN DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT (Momentarily on)
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
(a–j: on concurrently for 5 seconds)
k. VERB-NOUN Flashing
l. PGNS, CMC and ISS lamps on Indicator Control panel
m. Plus 88888 in Row 1, Row 2 and Row 3
(k–m: on concurrently for 5 seconds (CMC remains on approx. 60 seconds after other lamps go out))

After indications a through m go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following MAIN DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe		
	VERB 24	NOUN 01	Flashing
c.	01700		ENTR
d.	Observe		
	VERB 21	NOUN 01	Flashing
e.	+12345		ENTR
f.	Observe		
	VERB 22	NOUN 01	Flashing
g.	-67890	Do NOT press	ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on the MAIN DSKY. Observe that Row 1 and Row 2 are blank and that VERB 21 and NOUN 01 continue flashing.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform the following MAIN DSKY operations:

a.	VERB 57		ENTR

DATE ______

JOB G & N SYSTEM OPERATIONAL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

b.	0015		ENTR
c.	Observe DSKY blanks		
d.	VERB 21	NOUN 02	ENTR
e.	Observe		
	VERB 21	NOUN 02	Flashing
f.	01600		ENTR
g.	Observe		
	VERB 21	NOUN 02	Flashing
h.	33777		
i.	VERB 25	NOUN 26	ENTR
j.	Observe		
	VERB 21	NOUN 26	Flashing
k.	04000		ENTR
l.	Observe		
	VERB 22	NOUN 26	Flashing
m.	01600		ENTR
n.	Observe		
	VERB 23	NOUN 26	Flashing
o.	00003		ENTR
p.	VERB 30		ENTR

9. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

10. Press the RESET pushbutton on the MAIN DSKY. The RESTART, PGNS and G/N CAUTION lamps shall go out. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. Observe the DSKY blanks except the PROG lamp which shall indicate 00.

RUPT LOCK

11. Perform the following MAIN DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe		
	VERB 24	NOUN 01	Flashing
c.	01600		
d.	Observe		
	VERB 21	NOUN 01	Flashing
e.	30001		
f.	Observe		
	VERB 22	NOUN 01	Flashing
g.	01600		ENTR
h.	VERB 25	NOUN 26	ENTR
i.	Observe		
	VERB 21	NOUN 26	Flashing
j.	00001		ENTR
k.	Observe		
	VERB 22	NOUN 26	Flashing
l.	01600		ENTR
m.	Observe		
	VERB 23	NOUN 26	Flashing
n.	00003		ENTR
o.	VERB 31		ENTR

DATE ______

JOB G & N SYSTEM OPERATIONAL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

12. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 1 on the Logic Drawer No. 1 of the CTS shall be lighted.

13. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

TC TRAP TEST

14. Perform the following MAIN DSKY operations:

a.	VERB 21	NOUN 02	ENTR
b.	Observe		
	VERB 21	NOUN 02	Flashing
c.	01600		ENTR
d.	Observe		
	VERB 21	NOUN 02	Flashing
e.	01600		ENTR
f.	VERB 25	NOUN 26	ENTR
g.	Observe		
	VERB 21	NOUN 26	Flashing
h.	04000		ENTR
i.	Observe		
	VERB 22	NOUN 26	Flashing
j.	01600		ENTR
k.	Observe		
	VERB 23	NOUN 26	Flashing
l.	00003		ENTR
m.	VERB 30		ENTR

15. Verify that the RESTART condition lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 3 in the Logic Drawer No. 1 of the CTS shall be lighted.

16. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe		
	VERB 24	NOUN 01	Flashing
c.	01600		ENTR
d.	Observe		
	VERB 21	NOUN 01	Flashing
e.	30001		ENTR
f.	Observe		
	VERB 22	NOUN 01	Flashing
g.	01600		ENTR
h.	VERB 25	NOUN 26	ENTR
i.	Observe		
	VERB 21	NOUN 26	Flashing
j.	34000		ENTR
k.	Observe		
	VERB 22	NOUN 26	Flashing
l.	01600		ENTR

DATE ______

m. Observe

VERB 23	NOUN 26	Flashing

n. 00003 ENTR

o. VERB 30 ENTR

18. Verify that the RESTART conditon lamp on the MAIN DSKY and PGNS lamp on the Indicator Control panel are lighted. The G/N CAUTION lamp on the Monitor panel shall be lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY. The AGC ALARM lamp 5 on the Logic Drawer No. 1 of the CTS shall be lighted.

19. Press the RESET pushbutton on the MAIN DSKY. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY.

NAV DSKY CHECK

20. Repeat steps 2 through 19 for the NAV DSKY.

IRIG AND PIPA TEST INITIALIZATION

21. Press the ISS OPERATE pushbutton on the Test Control panel.

22. Connect the input bus on the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

23. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.8 (±0.30) vdc. Record indication.

CGC SELF CHECK

24. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. Observe

VERB 21	NOUN 27	Flashing

c. 77767 ENTR

Allow the test to run 5 minutes. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

PIPA AND IRIG TEST (Nominal Voltage)

25. Insure that at least 90 seconds have elapsed since performing step 21 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

26. Perform the following DSKY operations:

a. VERB 57 ENTR

b. Observe

VERB 21	NOUN 01	Flashing

c. 00004 ENTR

d. Observe

VERB 16	NOUN 20	Displayed

The NO ATT lamp shall light momentarily then go out.

27. In approximately 15 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed on Row 1 and Row 2. Record indications. (During the 15 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500, and 45000 respectively and no program alarms shall occur.)

DATE ________

---

28. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

29. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y, and Z IRIGS will be displayed in Row 2. Record indication. Record any failures indicated by VERB 05 and NOUN 31 being displayed on the DSKY's. If no failure occurs, write none on the Data Sheet.

30. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

31. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 25.8 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

32. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

33. Repeat steps 24 through 29.

34. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 30.8 (+0.0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

36. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

37. Repeat steps 24 through 29.

38. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

39. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

40. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.5) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

41. Perform calculations on the calculation sheet.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12206
REV. -
INITIAL TDRR 27882

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ________ DWG ________ REV. ________

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE

NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
1 thru 20	Displays	All DSKY character and condition lamps performed as required						
23	CGC 28 vdc Bus	vdc	27.50		28.50			a
24	Self Test Failures	▨	▨		▨			
27	gravity	cm/sec^2	975.0	R1 — — — — — R2 — — — — —	985.9			b
29	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			c
	Self Test Failures	▨	▨		▨			
31	CGC 28 vdc Bus	vdc	25.8		26.05			d
33 (27)	gravity	cm/sec^2	975.0	R1 — — — — — R2 — — — — —	985.9			e
33 (29)	Horizontal earth	ERU	See Table 1		See Table 1			f
	Self Test Failures	▨	▨		▨			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12206
REV. -

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
35	CGC 28 vdc Bus	vdc	30.55		30.8			g
37 (27)	gravity	cm/sec^2	975.0	R1 — — — — — R1 — — — — —	985.9			h
37 (29)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1			i
	Self Test Failures	▨	▨		▨			
41	Δgravity (low bus)	cm/sec^2	-1		+1			j
	Δhorizontal earth rate (low bus)	meru	-25		+25			k
	Δgravity (high bus)	cm/sec^2	-1		+1			l
	Δhorizontal earth rate (high bus)	meru	-25		+25			m

JDC ITEM NO.	CALCULATIONS
41	line b - line e = j = ________ line c - line f = k = ________ line b - line h = l = ________ line c - line i = m = ________

DATE ________

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV.** A **PAGE** 1 **OF** 6

INITIAL TDRR 29882 **D.S. PGS.** 3

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB

REFERENCES PS-2015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Adjust Coolant Console TEMP controls as necessary to keep the GDB Temperature Meter nulled within the tolerances of step 10 of JDC 12203.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. Insure the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR
b. VERB 36 ENTR

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV** A **PAGE** 2 **OF** 6

SUBSYSTEM G & N SYSTEM | **ASSY**

IMU TIME DELAY

7. Set the Oscillograph Signal Selector panel to monitor the following signals:

a. Sin A_{OG} 1X CHANNEL 2 - 7
b. Sin A_{MG} 1X CHANNEL 3 - 7
c. Sin A_{IG} 1X CHANNEL 4 - 7

8. Insure that the 800~0 PH REFERENCE and CH3AC and CH4AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

9. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set the Channel 2, 3, and 4 sensitivity on the Oscillograph Amplifier panel to 50 MV/MM.

10. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 11 NOUN 10 ENTR
c. 00012 ENTR

11. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel and the EVENT MARKER on the Oscillograph Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM for approximately 90 seconds.

14. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000 and observe the voltage on the DVM indicates +120 ±6 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Stop the Oscillograph.

16. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +22500 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +22500 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +22500 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights.

17. When the DSKY registers display:
Row 1 approximately +22500
Row 2 approximately +22500
Row 3 approximately +22500

The GIMBAL LOCK lamps on the DSKYs and the Monitor panel shall be lighted. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ ISS OPERATE pushbutton shall go out.

DATE

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV** A **PAGE** 3 **OF** 6

SUBSYSTEM G & N SYSTEM | **ASSY**

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3 DC.
b. IRIG Temperature on CHANNEL 4-3 DC.
c. IMU Heater Discrete on CHANNEL 5 AUX.
d. IMU Blower Discrete on CHANNEL 6 AUX.

19. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, 5, and 6 on the Oscillograph Amplifier.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set the CHART SPEEDS to 1, RANGE to 20 MV/ MM and CHART DRIVE to MM/ SEC on the Oscillograph Control for CHANNELS 3 and 4, and to 20 V/ CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

27. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNELS 3 and 4. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Calculate and record the difference between the PIPA and IRIG voltage indications.

DATE 30 JUN 66

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV** A **PAGE** 4 **OF** 6

SUBSYSTEM G & N SYSTEM | **ASSY**

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/ SEC.

30. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTER

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
NO ATT lamp lights

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 32, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

40. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins

DATE 30 JUN 66

TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40	NOUN 20	ENTR
b. Wait 5 seconds		
c. VERB 41	NOUN 20	ENTR
d. Observe		
VERB 21	NOUN 22	Flashing
e. +00200		ENTR
f. Observe		
VERB 22	NOUN 22	Flashing
g. +00200		ENTR
h. Observe		
VERB 23	NOUN 22	Flashing
i. +00200		ENTR
j. VERB 16	NOUN 20	ENTR
k. Observe		
NO ATT lamp lights		

45. When the DSKY registers display

Row 1 approximately +00200

Row 2 approximately +00200

Row 3 approximately +00200

Press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel.

46. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensibility of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 11	NOUN 10	ENTR
b. 00012		ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours

---

since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

50. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 49. Calculate and record the difference.

51. Compare the PIPA temperature recorded in step 39 with the PIPA temperature recorded in step 49. Calculate and record the difference.

52. Compare the IRIG temperature recorded in step 40 with the IRIG temperature recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

54. Record the maximum and minimum voltage indicated on CHANNEL 6.

MASTER ALARM TEST

55. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

56. Press the TEST START pushbutton.

57. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

58. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

MASTER ALARM RESET TEST

59. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

60. Set the CONDITION LAMPS switch on the Indicator Control panel to TEST.

61. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights.

62. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

NORMALIZATION

63. Perform the following DSKY operations:

a. VERB 40	NOUN 20	ENTR
b. Wait 5 seconds		
c. VERB 41	NOUN 20	ENTR
d. +00000		ENTR
e. +00000		ENTR
f. +00000		ENTR
g. Observe		
NO ATT lamp lights		

64. Observe that the Electro Luminescent lighting on the Indicator Control panel is lighted.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12207
REV. A
INITIAL TDRR 29882

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE

NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
27	CHANNEL 3 voltage	vdc	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
28	|CH 3| - |CH 4|		▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

TEST HISTORY

DATE START ______ END ______ ______ SYSTEM NO.

TIME START ______ END ______

OPERATOR ______

JDC
NO. 12207
REV. A

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
35	MG DSKY position	▨	▨				▨	▨	▨
(cont)	IG DSKY position	▨	▨				▨	▨	▨
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
39	Time	min	▨				▨		
	CHANNEL 3 voltage	vdc	▨				▨		
40	Time	min	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. A

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxxox				xxxox		
49	CHANNEL 3 voltage	vdc	-0.5				+0.5		
	CHANNEL 4 voltage	vdc	-0.5				+0.5		
50	|Step 27| - |Step 49|	vdc	▨				0.25		
51	|Step 39| - |Step 49|	vdc	▨				0.25		
52	|Step 40| - |Step 49|	vdc	▨				0.25		
53	ON State CHANNEL 5 voltage	vdc	27				29		
	OFF State CHANNEL 5 voltage	vdc	0.0				5.0		
54	ON State CHANNEL 6 voltage	vrms	0.0				5.0		
	OFF State CHANNEL 6 voltage	vdc	25.9				30.1		
57	MASTER ALARM lamp	▨	lights				▨		
61	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 REV. B PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2,3,4,6	3	EA	WS

REFERENCES PS-2015000

IMPORTANT

See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Adjust Coolant Console TEMP controls as necessary to keep the GDB Temperature Meter nulled within the tolerances of step 10 of JDC 12203.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. Insure the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR

b. VERB 36 ENTR

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 REV B PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Press the CHART SPEEDS 5 pushbutton on the oscillograph Control panel.

10. Perform the following DSKY operations:

a. VERB 36 ENTR

b. VERB 11 NOUN 10 ENTR

c. 00012 ENTR

11. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel and the EVENT MARKER on the Oscillograph Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM for approximately 90 seconds.

14. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000 and observe the voltage on the DVM indicates +120 ±6 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Stop the Oscillograph.

16. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR

b. Wait 5 seconds.

c. VERB 41 NOUN 20 ENTR

d. Observe

VERB 21 NOUN 22 Flashing

e. +22500 ENTR

f. Observe

VERB 22 NOUN 22 Flashing

g. +22500 ENTR

h. Observe

VERB 23 NOUN 22 Flashing

i. +22500 ENTR

j. VERB 16 NOUN 20 ENTR

k. Observe

NO ATT lamp lights.

17. When the DSKY registers display:

Row 1 approximately +22500

Row 2 approximately +22500

Row 3 approximately +22500

The GIMBAL LOCK lamps on the DSKYs and the Monitor panel shall be lighted. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ ISS OPERATE pushbutton shall go out.

DATE ________

JOB OPERATE CONTROL TEST

JDC 12207 REV B PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3 DC.

b. IRIG Temperature on CHANNEL 4-3 DC.

c. IMU Heater Discrete on CHANNEL 5 AUX.

d. IMU Blower Discrete on CHANNEL 6 AUX.

19. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set the CHART SPEEDS to 1, RANGE to 20 MV/ MM and CHART DRIVE to MM/ SEC on the Oscillograph Control for CHANNELS 3 and 4, and to 20 V/ CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00012 ENTR

27. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNELS 3 and 4. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Calculate and record the difference between the PIPA and IRIG voltage indications.

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JOB OPERATE CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/ SEC.

30. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTER

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. +00000 ENTR

c. +00000 ENTR

d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe

VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe

VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe

NO ATT lamp lights

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 32, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

40. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins

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TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights

45. When the DSKY registers display

Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel.

46. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensibility of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours

---

since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

50. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 49. Calculate and record the difference.

51. Compare the PIPA temperature recorded in step 39 with the PIPA temperature recorded in step 49. Calculate and record the difference.

52. Compare the IRIG temperature recorded in step 40 with the IRIG temperature recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

54. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

55. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

56. Press the TEST START pushbutton.

57. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

58. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

MASTER ALARM RESET TEST

59. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

60. Set the CONDITION LAMPS switch on the Indicator Control panel to TEST.

61. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights.

62. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

NORMALIZATION

63. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR
g. Observe
NO ATT lamp lights

64. Observe that the Electro Luminescent lighting on the Indicator Control panel is lighted.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12207
REV. B
INITIAL TDRR 29882

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
27	CHANNEL 3 voltage	vdc	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
28	|CH 3| - |CH 4|		▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

TEST HISTORY
DATE START ____ END ____ ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12207
REV. B

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
35	MG DSKY position	▨	▨				▨	▨	▨
(cont)	IG DSKY position	▨	▨				▨	▨	▨
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
39	Time	min	▨				▨		
	CHANNEL 3 voltage	vdc	▨				▨		
40	Time	min	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. B

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxx3x				xxx3x		
49	CHANNEL 3 voltage	vdc	-0.5				+0.5		
	CHANNEL 4 voltage	vdc	-0.5				+0.5		
50	|Step 27| - |Step 49|	vdc	▨				0.25		
51	|Step 39| - |Step 49|	vdc	▨				0.25		
52	|Step 40| - |Step 49|	vdc	▨				0.25		
53	ON State CHANNEL 5 voltage	vdc	27				29		
	OFF State CHANNEL 5 voltage	vdc	0.0				5.0		
54	ON State CHANNEL 6 voltage	vrms	0.0				5.0		
	OFF State CHANNEL 6 voltage	vdc	25.9				30.1		
57	MASTER ALARM lamp	▨	lights				▨		
61	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

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JOB OPERATE CONTROL TEST

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INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2,3,4,6	3	EA	WS
C	10-13-66	31510	2	1	EA	-

REFERENCES PS-2015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Adjust Coolant Console TEMP controls as necessary to keep the GDB Temperature Meter nulled within the tolerances of step 10 of JDC 12203.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. Insure the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR
b. VERB 36 ENTR

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB OPERATE CONTROL TEST

JDC 12207 REV C PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 11 NOUN 10 ENTR
c. 00012 ENTR

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM.

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 00030 to 40000 and observe the voltage on the DVM indicates +120 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 40 , NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +22500 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +22500 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +22500 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights.

17. When the DSKY registers display:
Row 1 approximately +22500
Row 2 approximately +22500
Row 3 approximately +22500

The GIMBAL LOCK lamps on the DSKYs and the Monitor panel shall be lighted. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

DATE

JOB OPERATE CONTROL TEST

JDC 12207 REV C PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3 DC.
b. IRIG Temperature on CHANNEL 4-3 DC.
c. IMU Heater Discrete on CHANNEL 5 AUX.
d. IMU Blower Discrete on CHANNEL 6 AUX.

19. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set the CHART SPEEDS to 1, RANGE to 20 MV/MM and CHART DRIVE to MM/SEC on the Oscillograph Control for CHANNELS 3 and 4, and to 20 V/CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

27. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNELS 3 and 4. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Calculate and record the difference between the PIPA and IRIG voltage indications.

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JOB OPERATE CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTER

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

	Signal	CROSSBAR CONTROL
a.	Cos A_{OG} 1X	241
b.	Cos A_{MG} 1X	242
c.	Cos A_{IG} 1X	243
d.	Sin A_{OG} 1X	142
e.	Sin A_{MG} 1X	143
f.	Sin A_{IG} 1X	144

37. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
NO ATT lamp lights

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 32, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

40. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins

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SUBSYSTEM G & N SYSTEM | ASSY

TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights

45. When the DSKY registers display

Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel.

46. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensibility of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours

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SUBSYSTEM G & N SYSTEM | ASSY

since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

50. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 49. Calculate and record the difference.

51. Compare the PIPA temperature recorded in step 39 with the PIPA temperature recorded in step 49. Calculate and record the difference.

52. Compare the IRIG temperature recorded in step 40 with the IRIG temperature recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

54. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

55. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

56. Press the TEST START pushbutton.

57. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

58. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

MASTER ALARM RESET TEST

59. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

60. Set the CONDITION LAMPS switch on the Indicator Control panel to TEST.

61. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights.

62. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

NORMALIZATION

63. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR
g. Observe
NO ATT lamp lights

64. Observe that the Electro Luminescent lighting on the Indicator Control panel is lighted.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12207
REV. C
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JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	AC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
15	Elapsed time	sec	85				95		
27	CHANNEL 3 voltage	vdc	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
28	|CH 3| - |CH 4|		▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. C

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
35	MG DSKY position	▨	▨				▨	▨	▨
(cont)	IG DSKY position	▨	▨				▨	▨	▨
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
39	Time	min	▨				▨		
	CHANNEL 3 voltage	vdc	▨				▨		
40	Time	min	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. C

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxx3x				xxx3x		
49	CHANNEL 3 voltage	vdc	-0.5				+0.5		
	CHANNEL 4 voltage	vdc	-0.5				+0.5		
50	|Step 27| - |Step 49|	vdc	▨				0.25		
51	|Step 39| - |Step 49|	vdc	▨				0.25		
52	|Step 40| - |Step 49|	vdc	▨				0.25		
53	ON State CHANNEL 5 voltage	vdc	27				29		
	OFF State CHANNEL 5 voltage	vdc	0.0				5.0		
54	ON State CHANNEL 6 voltage	vrms	0.0				5.0		
	OFF State CHANNEL 6 voltage	vdc	25.9				30.1		
57	MASTER ALARM lamp	▨	lights				▨		
61	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV.** D **PAGE** 1 **OF** 7
INITIAL TDRR 29882 **D.S. PGS** 4

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2,3,4,6	3	EA	WS
C	10-13-66	31510	2	1	EA	-
D	1-26-67	32759	2,3,4,5,6	2,3	EA	-

REFERENCES PS-2015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Adjust Coolant Console TEMP controls as necessary to keep the GDB Temperature Meter nulled within the tolerances of step 10 of JDC 12203.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. Insure the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR
b. VERB 36 ENTR

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV** D **PAGE** 2 **OF** 7

SUBSYSTEM G & N SYSTEM | **ASSY**

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 11 NOUN 10 ENTR
c. 00012 ENTR

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM.

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 00030 to 40000 and observe the voltage on the DVM indicates +120 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +22500 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +22500 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +22500 ENTR
j. Observe
NO ATT lamp lights

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

17. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR
b. Observe the DSKY registers display
Row 1 approximately +22500
Row 2 approximately +22500
Row 3 approximately +22500

DATE 30 JUN 66

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV** D **PAGE** 3 **OF** 7

SUBSYSTEM G & N SYSTEM | **ASSY**

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3 DC.
b. IRIG Temperature on CHANNEL 4-3 DC.
c. IMU Heater Discrete on CHANNEL 5 AUX.
d. IMU Blower Discrete on CHANNEL 6 AUX.

19. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set the CHART SPEEDS to 1, RANGE to 20 MV/MM and CHART DRIVE to MM/SEC on the Oscillograph Control for CHANNELS 3 and 4, and to 20 V/CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

27. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNELS 3 and 4. Stop the Oscillograph. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Calculate and record the difference between the PIPA and IRIG voltage indications.

DATE 30 JUN 66

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV** D **PAGE** 4 **OF** 7

SUBSYSTEM G & N SYSTEM | **ASSY**

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTER

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

37. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 32, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

40. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins

DATE 30 JUN 66

TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights

45. When the DSKY registers display
Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Enter VERB 34 into the DSKY and press the ENTR pushbutton. Press and hold the IMU CAGE COMMAND pushbutton on the Test Control Panel.

46. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

48A. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

50. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 49. Calculate and record the difference.

51. Compare the PIPA temperature recorded in step 39 with the PIPA temperature recorded in step 49. Calculate and record the difference.

52. Compare the IRIG temperature recorded in step 40 with the IRIG temperature recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

54. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

55. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

56. Press the TEST START pushbutton.

57. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

58. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

MASTER ALARM RESET TEST

59. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

60. Set the CONDITION LAMPS switch on the Indicator Control panel to TEST.

61. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights.

---

62. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

63. Observe and record that the electroluminescent lighting on the Indicator Control panel is lighted.

64. Perform the following DSKY operations:

VERB 57 ENTR
00015 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12207 JDC
REV. D
INITIAL TDRR 29882

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION
APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
15	Elapsed time	sec	85				95		
27	CHANNEL 3 voltage	vdc	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
28	|CH 3| - |CH 4|		▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 00149
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 4

TEST HISTORY		
DATE START ____	END ____	SYSTEM NO. ____
TIME START ____	END ____	
OPERATOR ____		

JDC
NO. 12207
REV. D

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
35	MG DSKY position	▨	▨				▨	▨	▨
(cont)	IG DSKY position	▨	▨				▨	▨	▨
37	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
39	Time	min	▨				▨		
	CHANNEL 3 voltage	vdc	▨				▨		
40	Time	min	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 00154
New 9-30-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

TEST HISTORY		
DATE START ____	END ____	SYSTEM NO. ____
TIME START ____	END ____	
OPERATOR ____		

JDC
NO. 12207
REV. D

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxx3x				xxx3x		
49	CHANNEL 3 voltage	vdc	-0.5				+0.5		
	CHANNEL 4 voltage	vdc	-0.5				+0.5		
50	|Step 27| - |Step 49|	vdc	▨				0.25		
51	|Step 39| - |Step 49|	vdc	▨				0.25		
52	|Step 40| - |Step 49|	vdc	▨				0.25		
53	ON State CHANNEL 5 voltage	vdc	27				29		
	OFF State CHANNEL 5 voltage	vdc	0.0				5.0		
54	ON State CHANNEL 6 voltage	vrms	0.0				5.0		
	OFF State CHANNEL 6 voltage	vdc	25.9				30.1		
57	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 00154
New 9-30-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

TEST HISTORY		
DATE START ____	END ____	SYSTEM NO. ____
TIME START ____	END ____	
OPERATOR ____		

JDC
NO. 12207
REV. D

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
61	MASTER ALARM lamp	▨	lights				▨		
63	Electro-luminescent lighting	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 00154
New 9-30-65

JOB OPERATE CONTROL TEST

JDC 12207 REV. E PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2,3,4,6	3	EA	WS
C	10-13-66	31510	2	1	EA	-
D	1-26-67	32759	2,3,4,5,6	2,3	EA	-
E	3-30-67	33467	1	3	EA	-

REFERENCES PS-2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Adjust Coolant Console TEMP controls as necessary to keep the GDB Temperature Meter nulled within the tolerances of step 10 of JDC 12203.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. Insure the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR

b. VERB 36 ENTR

c. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 REV E PAGE 2 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Perform the following DSKY operations:

a. VERB 36 ENTR

b. VERB 11 NOUN 10 ENTR

c. 00012 ENTR

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO

CLOCK FREQUENCY DIVIDER to 10^4

CLOCK SELECTOR to INT

INPUT SELECTOR to C SENSE

SENSE SELECTOR to FWD

FUNCTION to COUNT

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM.

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 00030 to 40000 and observe the voltage on the DVM indicates +120 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR

b. Wait 5 seconds.

c. VERB 41 NOUN 20 ENTR

d. Observe

VERB 21 NOUN 22 Flashing

e. +22500 ENTR

f. Observe

VERB 22 NOUN 22 Flashing

g. +22500 ENTR

h. Observe

VERB 23 NOUN 22 Flashing

i. +22500 ENTR

j. Observe

NO ATT lamp lights

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

17. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR

b. Observe the DSKY registers display

Row 1 approximately +22500

Row 2 approximately +22500

Row 3 approximately +22500

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 REV E PAGE 3 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3 DC.

b. IRIG Temperature on CHANNEL 4-3 DC.

c. IMU Heater Discrete on CHANNEL 5 AUX.

d. IMU Blower Discrete on CHANNEL 6 AUX.

19. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set the CHART SPEEDS to 1, RANGE to 20 MV/MM and CHART DRIVE to MM/SEC on the Oscillograph Control for CHANNELS 3 and 4, and to 20 V/CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00012 ENTR

27. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNELS 3 and 4. Stop the Oscillograph. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Calculate and record the difference between the PIPA and IRIG voltage indications.

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JOB OPERATE CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTER

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR

b. Wait 5 seconds.

c. VERB 41 NOUN 20 ENTR

d. Observe

VERB 21 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 22 NOUN 22 Flashing

g. +00000 ENTR

h. Observe

VERB 23 NOUN 22 Flashing

i. +00000 ENTR

j. Observe

NO ATT lamp lights.

37. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 32, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

40. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins

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TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights

45. When the DSKY registers display

Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Enter VERB 34 into the DSKY and press the ENTR pushbutton. Press and hold the IMU CAGE COMMAND pushbutton on the Test Control Panel.

46. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

	Signal	CROSSBAR CONTROL
a.	Sin A_{OG} 1X	142
b.	Sin A_{MG} 1X	143
c.	Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

48A. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

50. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 49. Calculate and record the difference.

51. Compare the PIPA temperature recorded in step 39 with the PIPA temperature recorded in step 49. Calculate and record the difference.

52. Compare the IRIG temperature recorded in step 40 with the IRIG temperature recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

54. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

55. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

56. Press the TEST START pushbutton.

57. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

58. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

MASTER ALARM RESET TEST

59. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

60. Set the CONDITION LAMPS switch on the Indicator Control panel to TEST.

61. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights.

---

62. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

63. Observe and record that the electroluminescent lighting on the Indicator Control panel is lighted.

64. Perform the following DSKY operations:

VERB 57 ENTR
00015 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4
JOB OPERATE CONTROL TEST

JDC NO. 12207
REV. E
INITIAL TDRR 29882

ASSEMBLY UNDER TEST

TITLE ____________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ ______ CAL DATE
NAME ____________ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
15	Elapsed time	sec	85				95		
27	CHANNEL 3 voltage	vdc	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
28	|CH 3| - |CH 4|		▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. E

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
35	MG DSKY position	▨	▨				▨	▨	▨
(cont)	IG DSKY position	▨	▨				▨	▨	▨
37	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
39	Time	min	▨				▨		
	CHANNEL 3 voltage	vdc	▨				▨		
40	Time	min	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. E

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxx3x				xxx3x		
49	CHANNEL 3 voltage	vdc	-0.5				+1.0		
	CHANNEL 4 voltage	vdc	-1.25				+1.25		
50	|Step 27| - |Step 49|	vdc	▨				0.50		
51	|Step 39| - |Step 49|	vdc	▨				0.25		
52	|Step 40| - |Step 49|	vdc	▨				0.25		
53	ON State CHANNEL 5 voltage	vdc	27				29		
	OFF State CHANNEL 5 voltage	vdc	0.0				5.0		
54	ON State CHANNEL 6 voltage	vrms	0.0				5.0		
	OFF State CHANNEL 6 voltage	vdc	25.9				30.1		
57	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. E

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
61	MASTER ALARM lamp	▨	lights				▨		
63	Electro-luminescent lighting	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

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JOB OPERATE CONTROL TEST

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INITIAL TDRR 29882 **D.S. PGS** 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2, 3, 4, 6	3	EA	WS
C	10-13-66	31510	2	1	EA	-
D	1-26-67	32759	2, 3, 4, 5, 6	2, 3	EA	-
E	3-30-67	33467	1	3	EA	-
F	6-6-67	33905	3, 4	1, 2, 3	EA	-

REFERENCES PS-2015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Adjust Coolant Console TEMP controls as necessary to keep the GDB Temperature Meter nulled within the tolerances of step 10 of JDC 12203.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. Insure the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR
b. VERB 36 ENTR
c. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM G & N SYSTEM

ASSY

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 11 NOUN 10 ENTR
c. 00012 ENTR

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM.

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 00030 to 40000 and observe the voltage on the DVM indicates +120 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +22500 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +22500 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +22500 ENTR
j. Observe
NO ATT lamp lights

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

17. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR
b. Observe the DSKY registers display
Row 1 approximately +22500
Row 2 approximately +22500
Row 3 approximately +22500

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SUBSYSTEM G & N SYSTEM

ASSY

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3 DC.
b. IRIG Temperature on CHANNEL 4-3 DC.
c. IMU Heater Discrete on CHANNEL 5 AUX.
d. IMU Blower Discrete on CHANNEL 6 AUX.

19. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set the CHART SPEEDS to 1, RANGE to 20 MV/MM and CHART DRIVE to MM/SEC on the Oscillograph Control for CHANNELS 3 and 4, and to 20 V/CM for CHANNEL 5 and 20 V/MM for CHANNEL 6.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

27. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNELS 3 and 4. Stop the Oscillograph. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Calculate and record the difference between the PIPA and IRIG voltage indications.

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SUBSYSTEM G & N SYSTEM

ASSY

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTER

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

37. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

40. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins

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TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights

45. When the DSKY registers display
Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Enter VERB 34 into the DSKY and press the ENTR pushbutton. Press and hold the IMU CAGE COMMAND pushbutton on the Test Control Panel.

46. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

48A. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

50. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 49. Calculate and record the difference.

51. Compare the PIPA temperature recorded in step 39 with the PIPA temperature recorded in step 49. Calculate and record the difference.

52. Compare the IRIG temperature recorded in step 40 with the IRIG temperature recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

54. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

55. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

56. Press the TEST START pushbutton.

57. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

58. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

MASTER ALARM RESET TEST

59. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

60. Set the CONDITION LAMPS switch on the Indicator Control panel to TEST.

61. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights.

---

62. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

63. Observe and record that the electroluminescent lighting on the Indicator Control panel is lighted.

64. Perform the following DSKY operations:

VERB 57 ENTR
00015 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12207 JDC
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JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ ____ CAL DATE
NAME ____ SER. NO. ____ ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
15	Elapsed time	sec	85				95		
27	CHANNEL 3 voltage	vdc	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
28	|CH 3| - |CH 4|		▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position (ROW 1)	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. F

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position (ROW 3)	▨	▨				▨	▨	▨
	IG DSKY position (ROW 2)	▨	▨				▨	▨	▨
37	Cos $A_{OG}1X$	vrms	23.4				28.6		
	Cos $A_{MG}1X$	vrms	23.4				28.6		
	Cos $A_{IG}1X$	vrms	23.4				28.6		
	Sin $A_{OG}1X$	vrms	0.00				0.50		
	Sin $A_{MG}1X$	vrms	0.00				0.50		
	Sin $A_{IG}1X$	vrms	0.00				0.50		
39	Time	min	▨				▨		
	CHANNEL 3 voltage	vdc	▨				▨		
40	Time	min	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin $A_{OG}1X$	vrms	0.00				0.50		
	Sin $A_{MG}1X$	vrms	0.00				0.50		
	Sin $A_{IG}1X$	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. F

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
48	Row 1 display	▨	xxx3x				xxx3x		
49	CHANNEL 3 voltage	vdc	-0.5				+1.0		
	CHANNEL 4 voltage	vdc	-1.25				+1.25		
50	|Step 27| - |Step 49|	vdc	▨				0.50		
51	|Step 39| - |Step 49|	vdc	▨				0.25		
52	|Step 40| - |Step 49|	vdc	▨				0.25		
53	ON State CHANNEL 5 voltage	vdc	27				29		
	OFF State CHANNEL 5 voltage	vdc	0.0				5.0		
54	ON State CHANNEL 6 voltage	vrms	0.0				5.0		
	OFF State CHANNEL 6 voltage	vrms	25.9				30.1		
57	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. F

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
61	MASTER ALARM lamp	▨	lights				▨		
63	Electro-luminescent lighting	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 REV. G PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2, 3, 4, 6	3	EA	WS
C	10-13-66	31510	2	1	EA	-
D	1-26-67	32759	2, 3, 4, 5, 6	2, 3	EA	-
E	3-30-67	33467	1	3	EA	-
F	6-6-67	33905	3, 4	1, 2, 3	EA	-
G	7-20-67	34178	1, 3, 4	1, 3	SB	-

REFERENCES PS-2015000

IMPORTANT

See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Adjust Coolant Console TEMP controls as necessary to keep the GDB temperature meter nulled within the tolerances of step 10 of JDC 12203.

2. Oscillograph sensitivities given in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. Insure the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR

b. VERB 36 ENTR

c. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 REV G PAGE 2 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Perform the following DSKY operations:

a. VERB 36 ENTR

b. VERB 11 NOUN 10 ENTR

c. 00012 ENTR

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO

CLOCK FREQUENCY DIVIDER to 10^4

CLOCK SELECTOR to INT

INPUT SELECTOR to C SENSE

SENSE SELECTOR to FWD

FUNCTION to COUNT

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM.

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 00030 to 40000 and observe the voltage on the DVM indicates +120 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR

b. Wait 5 seconds.

c. VERB 41 NOUN 20 ENTR

d. Observe

VERB 21 NOUN 22 Flashing

e. +22500 ENTR

f. Observe

VERB 22 NOUN 22 Flashing

g. +22500 ENTR

h. Observe

VERB 23 NOUN 22 Flashing

i. +22500 ENTR

j. Observe

NO ATT lamp lights

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

17. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR

b. Observe the DSKY registers display

Row 1 approximately +22500

Row 2 approximately +22500

Row 3 approximately +22500

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 REV G PAGE 3 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3 DC.

b. IRIG Temperature on CHANNEL 4-3 DC.

c. IMU Heater Discrete on CHANNEL 5 AUX.

d. IMU Blower Discrete on CHANNEL 6 AUX.

19. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set sensitivity on Oscillograph Amplifier for CHANNEL 3 to .2 V/CM, CHANNEL 4 to 2 V/CM, CHANNEL 5 to 20 V/CM, and CHANNEL 6 to 2 V/MM. Set CHART SPEEDS to 1 and CHART DRIVE to MM/SEC on Oscillograph Control panel.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00012 ENTR

27. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNELS 3 and 4. Stop the Oscillograph. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. (Deleted)

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

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JOB OPERATE CONTROL TEST

JDC 12207 REV G PAGE 4 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTER

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR

b. Wait 5 seconds.

c. VERB 41 NOUN 20 ENTR

d. Observe

VERB 21 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 22 NOUN 22 Flashing

g. +00000 ENTR

h. Observe

VERB 23 NOUN 22 Flashing

i. +00000 ENTR

j. Observe

NO ATT lamp lights.

37. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3. Change sensitivity on Oscillograph Amplifier for CHANNEL 3 to the smallest usable scale.

40. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4. Change sensitivity on Oscillograph Amplifier for CHANNEL 4 to the smallest usable scale.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins

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TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights

45. When the DSKY registers display
Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Enter VERB 34 into the DSKY and press the ENTR pushbutton. Press and hold the IMU CAGE COMMAND pushbutton on the Test Control Panel.

46. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

48A. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

50. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 49. Calculate and record the difference.

51. Compare the PIPA temperature recorded in step 39 with the PIPA temperature recorded in step 49. Calculate and record the difference.

52. Compare the IRIG temperature recorded in step 40 with the IRIG temperature recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

54. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

55. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

56. Press the TEST START pushbutton.

57. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

58. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

MASTER ALARM RESET TEST

59. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

60. Set the CONDITION LAMPS switch on the Indicator Control panel to TEST.

61. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights.

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62. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

63. Observe and record that the electroluminescent lighting on the Indicator Control panel is lighted.

64. Perform the following DSKY operations:

VERB 57 ENTR
00015 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12207
REV. G
INITIAL TDRR 29882

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
15	Elapsed time	sec	85				95		
27	CHANNEL 3 voltage	vdc	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
28	(Deleted)		▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position (ROW 1)	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. G

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
35 (cont)	MG DSKY position (ROW 3)	▨	▨				▨	▨	▨
	IG DSKY position (ROW 2)	▨	▨				▨	▨	▨
37	Cos $A_{OG}1X$	vrms	23.4				28.6		
	Cos $A_{MG}1X$	vrms	23.4				28.6		
	Cos $A_{IG}1X$	vrms	23.4				28.6		
	Sin $A_{OG}1X$	vrms	0.00				0.50		
	Sin $A_{MG}1X$	vrms	0.00				0.50		
	Sin $A_{IG}1X$	vrms	0.00				0.50		
39	Time	min	▨				▨		
	CHANNEL 3 voltage	vdc	▨				▨		
40	Time	min	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin $A_{OG}1X$	vrms	0.00				0.50		
	Sin $A_{MG}1X$	vrms	0.00				0.50		
	Sin $A_{IG}1X$	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. G

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxx3x				xxx3x		
49	CHANNEL 3 voltage	vdc	-0.5				+1.0		
	CHANNEL 4 voltage	vdc	-1.25				+1.25		
50	Step 27 - Step 49	vdc	▨				0.50		
51	Step 39 - Step 49	vdc	▨				0.25		
52	Step 40 - Step 49	vdc	▨				0.25		
53	ON State CHANNEL 5 voltage	vdc	25.8				31.8		
	OFF State CHANNEL 5 voltage	vdc	0.0				5.0		
54	ON State CHANNEL 6 voltage	vrms	0.0				5.0		
	OFF State CHANNEL 6 voltage	vrms	25.2				30.8		
57	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. G

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
61	MASTER ALARM lamp	▨	lights				▨		
63	Electro-luminescent lighting	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 REV. H PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2, 3, 4, 6	3	EA	WS
C	10-13-66	31510	2	1	EA	-
D	1-26-67	32759	2, 3, 4, 5, 6	2, 3	EA	-
E	3-30-67	33467	1	3	EA	-
F	6-6-67	33905	3, 4	1, 2, 3	EA	-
G	7-20-67	34178	1, 3, 4	1, 3	SB	-
H	2-29-68	35772	1-4, 6, 7	1, 3, 4	EA	-

REFERENCES PS-2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Adjust Coolant Console TEMP controls as necessary to keep the GDB temperature meter nulled within the tolerances of step 10 of JDC 12203.

2. Oscillograph sensitivities given in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. Insure the STBY lamp on the DSKY is not lighted. If lighted, press the PRO (or STBY) pushbutton until the STBY lamp goes out. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR

b. VERB 36 ENTR

c. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

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5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Perform the following DSKY operations:

a. VERB 36 ENTR

b. VERB 11 NOUN 10 ENTR

c. 00012 ENTR

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO

CLOCK FREQUENCY DIVIDER to 10^4

CLOCK SELECTOR to INT

INPUT SELECTOR to G SENSE

SENSE SELECTOR to FWD

FUNCTION to COUNT

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM.

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 00030 to 40000 and observe the voltage on the DVM indicates +120 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR

b. Wait 5 seconds.

c. VERB 36 ENTR

d. VERB 41 NOUN 20 ENTR

e. Observe

VERB 21 NOUN 22 Flashing

f. +22500 ENTR

g. Observe

VERB 22 NOUN 22 Flashing

h. +22500 ENTR

i. Observe

VERB 23 NOUN 22 Flashing

j. +22500 ENTR

k. Observe

NO ATT lamp lights

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

17. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR

b. Observe the DSKY registers display

Row 1 approximately +22500

Row 2 approximately +22500

Row 3 approximately +22500

---

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3 DC.

b. IRIG Temperature on CHANNEL 4-3 DC.

c. IMU Heater Discrete on CHANNEL 5-15.

d. IMU Blower Discrete on CHANNEL 6-15.

19. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set sensitivity on Oscillograph Amplifier for CHANNEL 3 to .2 V/CM, CHANNEL 4 to 2 V/CM, CHANNEL 5 to 20 V/CM, and CHANNEL 6 to 2 V/MM. Set CHART SPEEDS to 1 and CHART DRIVE to MM/SEC on Oscillograph Control panel.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00012 ENTR

27. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3.

28. Measure and record PIPA temperature deviation on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 255.

29. Measure and record IRIG temperature deviation on DVM by setting CROSSBAR CONTROL to 156.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

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32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTER

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR

b. Wait 5 seconds.

c. VERB 41 NOUN 20 ENTR

d. Observe

VERB 21 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 22 NOUN 22 Flashing

g. +00000 ENTR

h. Observe

VERB 23 NOUN 22 Flashing

i. +00000 ENTR

j. Observe

NO ATT lamp lights.

37. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 31, press EVENT MARKER on Oscillograph Control panel and record the time. Immediately set CROSSBAR CONTROL to 255 and measure and record PIPA temperature deviation as indicated on DVM.

40. 30 minutes after performing step 31, press EVENT MARKER on Oscillograph Control panel and record the time. Immediately set CROSSBAR CONTROL to 156 and measure and record IRIG temperature deviation as indicated on DVM.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins

TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights

45. When the DSKY registers display
Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Enter VERB 34 into the DSKY and press the ENTR pushbutton. Press and hold the IMU CAGE COMMAND pushbutton on the Test Control Panel.

46. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

48A. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and measure and record PIPA temperature deviation as indicated on DVM. Set CROSSBAR CONTROL to 156 and measure and record IRIG temperature deviation as indicated on DVM. Stop Oscillograph.

50. Compare the PIPA temperature deviation recorded in step 28 with the PIPA temperature deviation recorded in step 49. Calculate and record the difference.

51. Determine from the Oscillograph chart the maximum PIPA temperature deviation that occurred during the 15 minute period between performance of step 31 and step 39.

52. Compare the PIPA temperature deviation recorded in step 39 with the PIPA temperature deviation recorded in step 49. Calculate and record the difference.

53. Compare the IRIG temperature deviation recorded in step 40 with the IRIG temperature deviation recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

54. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

55. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

56. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

57. Press the TEST START pushbutton.

58. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

59. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

MASTER ALARM RESET TEST

60. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

61. Set the CONDITION LAMPS switch on the Indicator Control panel to TEST.

62. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights.

63. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

64. Observe and record that the electroluminescent lighting on the Indicator Control panel is lighted.

65. Perform the following DSKY operation:
VERB 36 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12207 JDC
REV. H
INITIAL TDRR 29882

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION
APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
15	Elapsed time	sec	85				95		
28	PIPA temperature deviation (Standby)	vdc	▨				▨		
29	IRIG temperature deviation (Standby)	vdc	▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position (ROW 1)	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. H

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position (ROW 3)	▨	▨				▨	▨	▨
	IG DSKY position (ROW 2)	▨	▨				▨	▨	▨
37	Cos A_{OG}^{1X}	vrms	23.4				28.6		
	Cos A_{MG}^{1X}	vrms	23.4				28.6		
	Cos A_{IG}^{1X}	vrms	23.4				28.6		
	Sin A_{OG}^{1X}	vrms	0.00				0.50		
	Sin A_{MG}^{1X}	vrms	0.00				0.50		
	Sin A_{IG}^{1X}	vrms	0.00				0.50		
39	Time	min	▨				▨		
	CHANNEL 3 voltage	vdc	▨				▨		
40	Time	min	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin A_{OG}^{1X}	vrms	0.00				0.50		
	Sin A_{MG}^{1X}	vrms	0.00				0.50		
	Sin A_{IG}^{1X}	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. H

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
48	Row 1 display	▨	xxx3x				xxx3x		
49	PIPA temperature deviation (Operate)	vdc	-0.5				+1.0		
	IRIG temperature deviation (Operate)	vdc	-1.25				+1.25		
50	|Step 28 - Step 49|	vdc	▨				0.50		
51	Maximum PIPA temperature deviation (Standby to Operate)	vdc	-0.75				+1.25		
52	|Step 39 - Step 49|	vdc	▨				0.25		
53	|Step 40 - Step 49|	vdc	▨				0.25		
54	ON State CHANNEL 5 voltage	vdc	-5.0				+5.0		
	OFF State CHANNEL 5 voltage	vdc	25.8				31.8		
55	ON State CHANNEL 6 voltage	vrms	-5.0				+5.0		
	OFF State CHANNEL 6 voltage	vrms	25.2				30.8		
58	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. H

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
62	MASTER ALARM lamp	▨	lights				▨		
64	Electro-luminescent lighting	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV.** J **PAGE** 1 **OF** 7
INITIAL TDRR 29882 **D.S. PGS.** 4

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mod. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2,3,4,6	3	EA	WS
C	10-13-66	31510	2	1	EA	-
D	1-26-67	32759	2,3,4,5,6	2,3	EA	-
E	3-30-67	33467	1	3	EA	-
F	6-6-67	33905	3,4	1,2,3	EA	-
G	7-20-67	34178	1,3,4	1,3	SB	-
H	2-29-68	35772	1-4,6,7	1,3,4	EA	-
J	4-25-68	36127	1-4,7	2	EA	-

REFERENCES PS-2015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Adjust Coolant Console TEMP controls as necessary to keep the GDB temperature meter nulled within the tolerances of step 10 of JDC 12203.

2. Oscillograph sensitivities given in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

3. Insure that the G & N Mounting Fixture is at the 32.5° position.

INITIALIZATION

NOTE: If the VERB display on the DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate power is applied.

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV** J **PAGE** 2 **OF** 7

SUBSYSTEM G & N SYSTEM | **ASSY**

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If pushbutton is pressed more than once, record in the System log the number of times pressed. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR
b. VERB 36 ENTR
c. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 11 NOUN 10 ENTR
c. 00012 ENTR

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM.

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 00030 to 40000 and observe the voltage on the DVM indicates +120 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 36 ENTR
d. VERB 41 NOUN 20 ENTR
e. Observe
VERB 21 NOUN 22 Flashing
f. +09000 ENTR
g. Observe
VERB 22 NOUN 22 Flashing
h. +09000 ENTR
i. Observe
VERB 23 NOUN 22 Flashing
j. +09000 ENTR
k. Observe
NO ATT lamp lights

DATE 30 JUN 66

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV** J **PAGE** 3 **OF** 7

SUBSYSTEM G & N SYSTEM | **ASSY**

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

17. Perform the following DSKY operations:

a. VERB 06 NOUN 30 ENTR
b. Observe the DSKY registers display
Row 1 approximately +09000
Row 2 approximately +09000
Row 3 approximately +09000

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3.
b. IRIG Temperature on CHANNEL 4-3.
c. IMU Heater Discrete on CHANNEL 5-15.
d. IMU Blower Discrete on CHANNEL 6-15.

19. Insure that the CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set sensitivity on Oscillograph Amplifier for CHANNEL 3 to .2 V/CM, CHANNEL 4 to 2 V/CM, CHANNEL 5 to 20 V/CM, and CHANNEL 6 to 2 V/MM. Set CHART SPEEDS to 1 and CHART DRIVE to MM/SEC on Oscillograph Control panel.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

DATE 30 JUN 66

JOB OPERATE CONTROL TEST | **JDC** 12207 **REV** J **PAGE** 4 **OF** 7

SUBSYSTEM G & N SYSTEM | **ASSY**

27. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3.

28. Measure and record PIPA temperature deviation on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 255.

29. Measure and record IRIG temperature deviation on DVM by setting CROSSBAR CONTROL to 156.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

37. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

DATE 30 JUN 66

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 31, press EVENT MARKER on Oscillograph Control panel and record the time. Immediately set CROSSBAR CONTROL to 255 and measure and record PIPA temperature deviation as indicated on DVM.

40. 30 minutes after performing step 31, press EVENT MARKER on Oscillograph Control panel and record the time. Immediately set CROSSBAR CONTROL to 156 and measure and record IRIG temperature deviation as indicated on DVM.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights

45. When the DSKY registers display

Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Enter VERB 34 into the DSKY and press the ENTR pushbutton. Press and hold the IMU CAGE COMMAND pushbutton on the Test Control Panel.

46. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

	Signal	CROSSBAR CONTROL
a.	Sin A_{OG} 1X	142
b.	Sin A_{MG} 1X	143
c.	Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

48A. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and measure and record PIPA temperature deviation as indicated on DVM. Set CROSSBAR CONTROL to 156 and measure and record IRIG temperature deviation as indicated on DVM. Stop Oscillograph.

50. Compare the PIPA temperature deviation recorded in step 28 with the PIPA temperature deviation recorded in step 49. Calculate and record the difference.

51. Determine from the Oscillograph chart the maximum PIPA temperature deviation that occurred during the 15 minute period between performance of step 31 and step 39.

52. Compare the PIPA temperature deviation recorded in step 39 with the PIPA temperature deviation recorded in step 49. Calculate and record the difference.

53. Compare the IRIG temperature deviation recorded in step 40 with the IRIG temperature deviation recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

54. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

55. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

56. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

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57. Press the TEST START pushbutton.

58. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

59. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

60. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

61. Set and hold the CONDITION LAMPS switch on the Indicator Control panel to TEST until completion of step 62.

62. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights. The STAR ACQ lamp will light. Set CONDITION LAMPS switch to ON.

63. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

64. Observe and record that the electroluminescent lighting on the Indicator Control panel is lighted.

65. Perform the following DSKY operation:

VERB 36 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12207
REV. J
INITIAL TDRR 29882

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
15	Elapsed time	sec	85				95		
28	PIPA temperature deviation (Standby)	vdc	▨				▨		
29	IRIG temperature deviation (Standby)	vdc	▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position (ROW 1)	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. J

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
35 (cont)	MG DSKY position (ROW 3)	▨	▨				▨	▨	▨
	IG DSKY position (ROW 2)	▨	▨				▨	▨	▨
37	Cos $A_{OG}1X$	vrms	23.4				28.6		
	Cos $A_{MG}1X$	vrms	23.4				28.6		
	Cos $A_{IG}1X$	vrms	23.4				28.6		
	Sin $A_{OG}1X$	vrms	0.00				0.50		
	Sin $A_{MG}1X$	vrms	0.00				0.50		
	Sin $A_{IG}1X$	vrms	0.00				0.50		
39	Time	min	▨				▨		
	PIPA temperature deviation	vdc	▨				▨		
40	Time	min	▨				▨		
	IRIG temperature deviation	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin $A_{OG}1X$	vrms	0.00				0.50		
	Sin $A_{MG}1X$	vrms	0.00				0.50		
	Sin $A_{IG}1X$	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. J

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxx3x				xxx3x		
49	PIPA temperature deviation (Operate)	vdc	-0.5				+1.0		
	IRIG temperature deviation (Operate)	vdc	-1.25				+1.25		
50	|Step 28 - Step 49|	vdc	▨				0.50		
51	Maximum PIPA temperature deviation (Standby to Operate)	vdc	-0.75				+1.25		
52	|Step 39 - Step 49|	vdc	▨				0.25		
53	|Step 40 - Step 49|	vdc	▨				0.25		
54	ON State CHANNEL 5 voltage	vdc	-5.0				+5.0		
	OFF State CHANNEL 5 voltage	vdc	25.8				31.8		
55	ON State CHANNEL 6 voltage	vrms	-5.0				+5.0		
	OFF State CHANNEL 6 voltage	vrms	25.2				30.8		
58	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. J

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
62	MASTER ALARM lamp	▨	lights				▨		
64	Electro-luminescent lighting	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 **REV.** K **PAGE** 1 **OF** 7

INITIAL TDRR 29882 **D.S. PGS** 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2,3,4,6	3	EA	WS
C	10-13-66	31510	2	1	EA	-
D	1-26-67	32759	2,3,4,5,6	2,3	EA	-
E	3-30-67	33467	1	3	EA	-
F	6-6-67	33905	3,4	1,2,3	EA	-
G	7-20-67	34178	1,3,4	1,3	SB	-
H	2-29-68	35772	1-4,6,7	1,3,4	EA	-
J	4-25-68	36127	1-4,7	2	EA	-
K	10-21-68	36932	5	-	EA	-

REFERENCES PS-2015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Adjust Coolant Console TEMP controls as necessary to keep the GDB temperature meter nulled within the tolerances of step 10 of JDC 12203.

2. Oscillograph sensitivities given in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

3. Insure that the G & N Mounting Fixture is at the 32.5° position.

INITIALIZATION

NOTE: If the VERB display on the DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate power is applied.

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If pushbutton is pressed more than once, record in the System log the number of times pressed. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR
b. VERB 36 ENTR
c. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 11 NOUN 10 ENTR
c. 00012 ENTR

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM.

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 00030 to 40000 and observe the voltage on the DVM indicates +120 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 36 ENTR
d. VERB 41 NOUN 20 ENTR
e. Observe
VERB 21 NOUN 22 Flashing
f. +09000 ENTR
g. Observe
VERB 22 NOUN 22 Flashing
h. +09000 ENTR
i. Observe
VERB 23 NOUN 22 Flashing
j. +09000 ENTR
k. Observe
NO ATT lamp lights

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

17. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR
b. Observe the DSKY registers display
Row 1 approximately +09000
Row 2 approximately +09000
Row 3 approximately +09000

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3.

b. IRIG Temperature on CHANNEL 4-3.

c. IMU Heater Discrete on CHANNEL 5-15.

d. IMU Blower Discrete on CHANNEL 6-15.

19. Insure that the CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-30 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set sensitivity on Oscillograph Amplifier for CHANNEL 3 to .2 V/CM, CHANNEL 4 to 2 V/CM, CHANNEL 5 to 20 V/CM, and CHANNEL 6 to 2 V/MM. Set CHART SPEEDS to 1 and CHART DRIVE to MM/SEC on Oscillograph Control panel.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

---

27. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3.

28. Measure and record PIPA temperature deviation on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 255.

29. Measure and record IRIG temperature deviation on DVM by setting CROSSBAR CONTROL to 156.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

37. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 31, press EVENT MARKER on Oscillograph Control panel and record the time. Immediately set CROSSBAR CONTROL to 255 and measure and record PIPA temperature deviation as indicated on DVM.

40. 30 minutes after performing step 31, press EVENT MARKER on Oscillograph Control panel and record the time. Immediately set CROSSBAR CONTROL to 156 and measure and record IRIG temperature deviation as indicated on DVM.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. Observe
NO ATT lights
k. VERB 16 NOUN 20 ENTR

45. When the DSKY registers display
Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Enter VERB 34 into the DSKY and press the ENTR pushbutton. Press and hold the IMU CAGE COMMAND pushbutton on the Test Control Panel.

46. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

48A. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and measure and record PIPA temperature deviation as indicated on DVM. Set CROSSBAR CONTROL to 156 and measure and record IRIG temperature deviation as indicated on DVM. Stop Oscillograph.

50. Compare the PIPA temperature deviation recorded in step 28 with the PIPA temperature deviation recorded in step 49. Calculate and record the difference.

51. Determine from the Oscillograph chart the maximum PIPA temperature deviation that occurred during the 15 minute period between performance of step 31 and step 39.

52. Compare the PIPA temperature deviation recorded in step 39 with the PIPA temperature deviation recorded in step 49. Calculate and record the difference.

53. Compare the IRIG temperature deviation recorded in step 40 with the IRIG temperature deviation recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

54. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

55. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

56. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

57. Press the TEST START pushbutton.

58. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

59. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

60. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

61. Set and hold the CONDITION LAMPS switch on the Indicator Control panel to TEST until completion of step 62.

62. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights. The STAR ACQ lamp will light. Set CONDITION LAMPS switch to ON.

63. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

64. Observe and record that the electroluminescent lighting on the Indicator Control panel is lighted.

65. Perform the following DSKY operation:
VERB 36 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 12207 JDC
REV. K
INITIAL TDRR 29882

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG. ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
15	Elapsed time	sec	85				95		
28	PIPA temperature deviation (Standby)	vdc	▨				▨		
29	IRIG temperature deviation (Standby)	vdc	▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position (ROW 1)	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. K

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
35 (cont)	MG DSKY position (ROW 3)	▨	▨				▨	▨	▨
	IG DSKY position (ROW 2)	▨	▨				▨	▨	▨
37	Cos A_{OG}1X	vrms	23.4				28.6		
	Cos A_{MG}1X	vrms	23.4				28.6		
	Cos A_{IG}1X	vrms	23.4				28.6		
	Sin A_{OG}1X	vrms	0.00				0.50		
	Sin A_{MG}1X	vrms	0.00				0.50		
	Sin A_{IG}1X	vrms	0.00				0.50		
39	Time	min	▨				▨		
	PIPA temperature deviation	vdc	▨				▨		
40	Time	min	▨				▨		
	IRIG temperature deviation	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin A_{OG}1X	vrms	0.00				0.50		
	Sin A_{MG}1X	vrms	0.00				0.50		
	Sin A_{IG}1X	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. K

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxx3x				xxx3x		
49	PIPA temperature deviation (Operate)	vdc	-0.5				+1.0		
	IRIG temperature deviation (Operate)	vdc	-1.25				+1.25		
50	|Step 28 - Step 49|	vdc	▨				0.50		
51	Maximum PIPA temperature deviation (Standby to Operate)	vdc	-0.75				+1.25		
52	|Step 39 - Step 49|	vdc	▨				0.25		
53	|Step 40 - Step 49|	vdc	▨				0.25		
54	ON State CHANNEL 5 voltage	vdc	-5.0				+5.0		
	OFF State CHANNEL 5 voltage	vdc	25.8				31.8		
55	ON State CHANNEL 6 voltage	vrms	-5.0				+5.0		
	OFF State CHANNEL 6 voltage	vrms	25.2				30.8		
58	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. K

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
62	MASTER ALARM lamp	▨	lights				▨		
64	Electro-luminescent lighting	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 REV. L PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2,3,4,6	3	EA	WS
C	10-13-66	31510	2	1	EA	-
D	1-26-67	32759	2,3,4,5,6	2,3	EA	-
E	3-30-67	33467	1	3	EA	-
F	6-6-67	33905	3,4	1,2,3	EA	-
G	7-20-67	34178	1,3,4	1,3	SB	-
H	2-29-68	35772	1-4,6,7	1,3,4	EA	-
J	4-25-68	36127	1-4,7	2	EA	-
K	10-21-68	36932	5	-	EA	-
L	5-26-70	38118	1	-	EA	-

REFERENCES PS-2015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Adjust Coolant Console TEMP controls as necessary to keep the GDB temperature meter nulled within the tolerances of step 10 of JDC 12203.

2. Oscillograph sensitivities given in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike cradle locking handles.

3. Insure that the G & N Mounting Fixture is at the 32.5° position.

INITIALIZATION

NOTE: If the VERB display on the DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate power is applied.

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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Chg. 3-18-66

JOB OPERATE CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If pushbutton is pressed more than once, record in the System log the number of times pressed. Press RSET and perform the following DSKY operations:

a. VERB 61		ENTR	
b. VERB 36		ENTR	

c. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Perform the following DSKY operations:

a. VERB 36		ENTR
b. VERB 11	NOUN 10	ENTR
c. 00012		ENTR

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM.

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 00030 to 40000 and observe the voltage on the DVM indicates +120 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 40	NOUN 20	ENTR
b. Wait 5 seconds.		
c. VERB 36		ENTR
d. VERB 41	NOUN 20	ENTR
e. Observe		
VERB 21	NOUN 22	Flashing
f. +09000		ENTR
g. Observe		
VERB 22	NOUN 22	Flashing

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JOB OPERATE CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

h. +09000		ENTR
i. Observe		
VERB 23	NOUN 22	Flashing
j. +09000		ENTR
k. Observe		

NO ATT lamp lights

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

17. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR

b. Observe the DSKY registers display
Row 1 approximately +09000
Row 2 approximately +09000
Row 3 approximately +09000

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3.

b. IRIG Temperature on CHANNEL 4-3.

c. IMU Heater Discrete on CHANNEL 5-15.

d. IMU Blower Discrete on CHANNEL 6-15.

19. Insure that the CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set sensitivity on Oscillograph Amplifier for CHANNEL 3 to .2 V/CM, CHANNEL 4 to 2 V/CM, CHANNEL 5 to 20 V/CM, and CHANNEL 6 to 2 V/MM. Set CHART SPEEDS to 1 and CHART DRIVE to MM/SEC on Oscillograph Control panel.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

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JOB OPERATE CONTROL TEST

JDC 12207 REV L PAGE 4 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11	NOUN 10	ENTR
b. 00012		ENTR

27. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3.

28. Measure and record PIPA temperature deviation on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 255.

29. Measure and record IRIG temperature deviation on DVM by setting CROSSBAR CONTROL to 156.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16	NOUN 20	ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 40	NOUN 20	ENTR
b. Wait 5 seconds.		
c. VERB 41	NOUN 20	ENTR
d. Observe		
VERB 21	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 22	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 23	NOUN 22	Flashing
i. +00000		ENTR
j. Observe		

NO ATT lamp lights.

37. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

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STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 31, press EVENT MARKER on Oscillograph Control panel and record the time. Immediately set CROSSBAR CONTROL to 255 and measure and record PIPA temperature deviation as indicated on DVM.

40. 30 minutes after performing step 31, press EVENT MARKER on Oscillograph Control panel and record the time. Immediately set CROSSBAR CONTROL to 156 and measure and record IRIG temperature deviation as indicated on DVM.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
ENTR
g. +00200
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. Observe
NO ATT lights
k. VERB 16 NOUN 20 ENTR

45. When the DSKY registers display
Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Enter VERB 34 into the DSKY and press the ENTR pushbutton. Press and hold the IMU CAGE COMMAND pushbutton on the Test Control Panel.

46. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

48A. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and measure and record PIPA temperature deviation as indicated on DVM. Set CROSSBAR CONTROL to 156 and measure and record IRIG temperature deviation as indicated on DVM. Stop Oscillograph.

50. Compare the PIPA temperature deviation recorded in step 28 with the PIPA temperature deviation recorded in step 49. Calculate and record the difference.

51. Determine from the Oscillograph chart the maximum PIPA temperature deviation that occurred during the 15 minute period between performance of step 31 and step 39.

52. Compare the PIPA temperature deviation recorded in step 39 with the PIPA temperature deviation recorded in step 49. Calculate and record the difference.

53. Compare the IRIG temperature deviation recorded in step 40 with the IRIG temperature deviation recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

54. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

55. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

56. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

---

57. Press the TEST START pushbutton.

58. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

59. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

60. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

61. Set and hold the CONDITION LAMPS switch on the Indicator Control panel to TEST until completion of step 62.

62. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights. The STAR ACQ lamp will light. Set CONDITION LAMPS switch to ON.

63. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

64. Observe and record that the electroluminescent lighting on the Indicator Control panel is lighted.

65. Perform the following DSKY operation:
VERB 36 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12207 JDC
REV. L
INITIAL TDRR 29882

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
15	Elapsed time	sec	85				95		
28	PIPA temperature deviation (Standby)	vdc	▨				▨		
29	IRIG temperature deviation (Standby)	vdc	▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position (ROW 1)	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. L

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
35 (cont)	MG DSKY position (ROW 3)	▨	▨				▨	▨	▨
	IG DSKY position (ROW 2)	▨	▨				▨	▨	▨
37	Cos A_{OG}^{1X}	vrms	23.4				28.6		
	Cos A_{MG}^{1X}	vrms	23.4				28.6		
	Cos A_{IG}^{1X}	vrms	23.4				28.6		
	Sin A_{OG}^{1X}	vrms	0.00				0.50		
	Sin A_{MG}^{1X}	vrms	0.00				0.50		
	Sin A_{IG}^{1X}	vrms	0.00				0.50		
39	Time	min	▨				▨		
	PIPA temperature deviation	vdc	▨				▨		
40	Time	min	▨				▨		
	IRIG temperature deviation	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin A_{OG}^{1X}	vrms	0.00				0.50		
	Sin A_{MG}^{1X}	vrms	0.00				0.50		
	Sin A_{IG}^{1X}	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 00 54
New 9-30 65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. L

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxx3x				xxx3x		
49	PIPA temperature deviation (Operate)	vdc	-0.5				+1.0		
	IRIG temperature deviation (Operate)	vdc	-1.25				+1.25		
50	|Step 28 - Step 49|	vdc	▨				0.50		
51	Maximum PIPA temperature deviation (Standby to Operate)	vdc	-0.75				+1.25		
52	|Step 39 - Step 49|	vdc	▨				0.25		
53	|Step 40 - Step 49|	vdc	▨				0.25		
54	ON State CHANNEL 5 voltage	vdc	-5.0				+5.0		
	OFF State CHANNEL 5 voltage	vdc	25.8				31.8		
55	ON State CHANNEL 6 voltage	vrms	-5.0				+5.0		
	OFF State CHANNEL 6 voltage	vrms	25.2				30.8		
58	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM [illegible]
New 9-30-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

TEST HISTORY
DATE START ______ END ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. L

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
62	MASTER ALARM lamp	▨	lights				▨		
64	Electro-luminescent lighting	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

FORM 00154
New 9-30-65

JOB OPERATE CONTROL TEST

JDC 12207 **REV.** M **PAGE** 1 **OF** 7

INITIAL TDRR 29882 **D.S. PGS** 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-21-66	30276	-	3	EA	MB
B	7-28-66	30299	2,3,4,6	3	EA	WS
C	10-13-66	31510	2	1	EA	-
D	1-26-67	32759	2,3,4,5,6	2,3	EA	-
E	3-30-67	33467	1	3	EA	-
F	6-6-67	33905	3,4	1,2,3	EA	-
G	7-20-67	34178	1,3,4	1,3	SB	-
H	2-29-68	35772	1-4,6,7	1,3,4	EA	-
J	4-25-68	36127	1-4,7	2	EA	-
K	10-21-68	36932	5	-	EA	-
L	5-26-70	38118	1	-	EA	-
M	2-8-71	38337	-	3	EA	-

REFERENCES PS-2015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Adjust Coolant Console TEMP controls as necessary to keep the GDB temperature meter nulled within the tolerances of step 10 of JDC 12203.

2. Oscillograph sensitivities given in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike cradle locking handles.

3. Insure that the G & N Mounting Fixture is at the 32.5° position.

INITIALIZATION

NOTE: If the VERB display on the DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

NOTE: The CMC warning lamp on the Indicator Control panel may light for approximately 10 seconds when +28 VDC CMC Operate power is applied.

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the

VERIFICATION WITH SIDL REQUIRED BEFORE USE

PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If pushbutton is pressed more than once, record in the System log the number of times pressed. Press RSET and perform the following DSKY operations:

a.	VERB 61		ENTR
b.	VERB 36		ENTR

c. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 11	NOUN 10	ENTR
c.	00012		ENTR

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM.

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 00030 to 40000 and observe the voltage on the DVM indicates +120 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a.	VERB 40	NOUN 20	ENTR
b.	Wait 5 seconds.		
c.	VERB 36		ENTR
d.	VERB 41	NOUN 20	ENTR
e.	Observe		
	VERB 21	NOUN 22	Flashing
f.	+09000		ENTR
g.	Observe		
	VERB 22	NOUN 22	Flashing

---

h.	+09000		ENTR
i.	Observe		
	VERB 23	NOUN 22	Flashing
j.	+09000		ENTR
k.	Observe		
	NO ATT lamp lights		

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

17. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR

b. Observe the DSKY registers display
   - Row 1 approximately +09000
   - Row 2 approximately +09000
   - Row 3 approximately +09000

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3.

b. IRIG Temperature on CHANNEL 4-3.

c. IMU Heater Discrete on CHANNEL 5-15.

d. IMU Blower Discrete on CHANNEL 6-15.

19. Insure that the CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-30 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, and 5 on the Oscillograph Amplifier. CHANNEL 6 may be calibrated after step 35.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set sensitivity on Oscillograph Amplifier for CHANNEL 3 to .2 V/CM, CHANNEL 4 to 2 V/CM, CHANNEL 5 to 20 V/CM, and CHANNEL 6 to 2 V/MM. Set CHART SPEEDS to 1 and CHART DRIVE to MM/SEC on Oscillograph Control panel.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a.	VERB 11	NOUN 10	ENTR
b.	00012		ENTR

27. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3.

28. Measure and record PIPA temperature deviation on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 255.

29. Measure and record IRIG temperature deviation on DVM by setting CROSSBAR CONTROL to 156.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a.	VERB 40	NOUN 20	ENTR
b.	Wait 5 seconds.		
c.	VERB 41	NOUN 20	ENTR
d.	Observe		
	VERB 21	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 22	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 23	NOUN 22	Flashing
i.	+00000		ENTR
j.	Observe		
	NO ATT lamp lights.		

37. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record indications:

	Signal	CROSSBAR CONTROL
a.	Cos A_{OG} 1X	241
b.	Cos A_{MG} 1X	242
c.	Cos A_{IG} 1X	243
d.	Sin A_{OG} 1X	142
e.	Sin A_{MG} 1X	143
f.	Sin A_{IG} 1X	144

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 31, press EVENT MARKER on Oscillograph Control panel and record the time. Immediately set CROSSBAR CONTROL to 255 and measure and record PIPA temperature deviation as indicated on DVM.

40. 30 minutes after performing step 31, press EVENT MARKER on Oscillograph Control panel and record the time. Immediately set CROSSBAR CONTROL to 156 and measure and record IRIG temperature deviation as indicated on DVM.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. Observe
NO ATT lights
k. VERB 16 NOUN 20 ENTR

45. When the DSKY registers display,
Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Enter VERB 34 into the DSKY and press the ENTR pushbutton. Press and hold the IMU CAGE COMMAND pushbutton on the Test Control Panel.

46. Set the PAVM FUNCTION selector to TOTAL and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

48A. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds.
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe
NO ATT lamp lights.

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and measure and record PIPA temperature deviation as indicated on DVM. Set CROSSBAR CONTROL to 156 and measure and record IRIG temperature deviation as indicated on DVM. Stop Oscillograph.

50. Compare the PIPA temperature deviation recorded in step 28 with the PIPA temperature deviation recorded in step 49. Calculate and record the difference.

51. Determine from the Oscillograph chart the maximum PIPA temperature deviation that occurred during the 15 minute period between performance of step 31 and step 39.

52. Compare the PIPA temperature deviation recorded in step 39 with the PIPA temperature deviation recorded in step 49. Calculate and record the difference.

53. Compare the IRIG temperature deviation recorded in step 40 with the IRIG temperature deviation recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

54. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

55. Record the maximum and/or minimum voltage indicated on CHANNEL 6 or both if the blower is cycling.

MASTER ALARM TEST

56. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

---

57. Press the TEST START pushbutton.

58. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

59. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

60. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

61. Set and hold the CONDITION LAMPS switch on the Indicator Control panel to TEST until completion of step 62.

62. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights. The STAR ACQ lamp will light. Set CONDITION LAMPS switch to ON.

63. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

64. Observe and record that the electroluminescent lighting on the Indicator Control panel is lighted.

65. Perform the following DSKY operation:
VERB 36 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12207 JDC
REV. M
INITIAL TDRR 29882

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
6	DVM voltage	volts	28.55				29.05		
15	Elapsed time	sec	85				95		
28	PIPA temperature deviation (Standby)	vdc	▨				▨		
29	IRIG temperature deviation (Standby)	vdc	▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position (ROW 1)	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. M

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
35 (cont)	MG DSKY position (ROW 3)	▨	▨				▨	▨	▨
	IG DSKY position (ROW 2)	▨	▨				▨	▨	▨
37	Cos $A_{OG}1X$	vrms	23.4				28.6		
	Cos $A_{MG}1X$	vrms	23.4				28.6		
	Cos $A_{IG}1X$	vrms	23.4				28.6		
	Sin $A_{OG}1X$	vrms	0.00				0.50		
	Sin $A_{MG}1X$	vrms	0.00				0.50		
	Sin $A_{IG}1X$	vrms	0.00				0.50		
39	Time	min	▨				▨		
	PIPA temperature deviation	vdc	▨				▨		
40	Time	min	▨				▨		
	IRIG temperature deviation	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin $A_{OG}1X$	vrms	0.00				0.50		
	Sin $A_{MG}1X$	vrms	0.00				0.50		
	Sin $A_{IG}1X$	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. M

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxx3x				xxx3x		
49	PIPA temperature deviation (Operate)	vdc	-0.5				+1.0		
	IRIG temperature deviation (Operate)	vdc	-1.25				+1.25		
50	|Step 28 - Step 49|	vdc	▨				0.50		
51	Maximum PIPA temperature deviation (Standby to Operate)	vdc	-0.75				+1.25		
52	|Step 39 - Step 49|	vdc	▨				0.25		
53	|Step 40 - Step 49|	vdc	▨				0.35		
54	ON State CHANNEL 5 voltage	vdc	-5.0				+5.0		
	OFF State CHANNEL 5 voltage	vdc	25.8				31.8		
55	ON State CHANNEL 6 voltage	vrms	-5.0				+5.0		
	OFF State CHANNEL 6 voltage	vrms	25.2				30.8		
58	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 4

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. M

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
62	MASTER ALARM lamp	▨	lights				▨		
64	Electro-luminescent lighting	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

JOB OPERATE CONTROL TEST

JDC 12207 REV. - PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, PSA Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete, Master Alarm and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES PS-2015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Adjust Coolant Console TEMP controls as necessary to keep the GDB Temperature Meter nulled within the tolerances of step 10 of JDC 12203.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the CGC and provide DSKY illumination. The pushbuttons shall light.

3. Insure the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press RSET and perform the following DSKY operations:

a. VERB 61 ENTR

b. VERB 36 ENTR

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.8 (±0.25) vdc. Record indication.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE __________

JOB OPERATE CONTROL TEST

JDC 12207 REV - PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

IMU TIME DELAY

7. Set the Oscillograph Signal Selector panel to monitor the following signals:

a. Sin A_{OG} 1X	CHANNEL 2 - 7
b. Sin A_{MG} 1X	CHANNEL 3 - 7
c. Sin A_{IG} 1X	CHANNEL 4 - 7

8. Insure that the 800 ~ 0 PH REFERENCE and CH3AC and CH4AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

9. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set the Channel 2, 3, and 4 sensitivity on the Oscillograph Amplifier panel to 50 MV/MM.

10. Perform the following DSKY operations:

a. VERB 36 ENTR

b. VERB 11 NOUN 10 ENTR

c. 00012 ENTR

11. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

12. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 259.

13. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel and the EVENT MARKER on the Oscillograph Control panel. The NO ATT lamp on the DSKY shall light. Observe the absence of +120 vdc on the DVM for approximately 90 seconds.

14. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000 and observe the voltage on the DVM indicates +120 ±6 vdc within 10 seconds. The NO ATT lamp on the DSKY shall go out.

15. Stop the Oscillograph.

16. Perform the following DSKY operations:

a.	VERB 40	NOUN 20	ENTR
b.	Wait 5 seconds.		
c.	VERB 41	NOUN 20	ENTR
d.	Observe		
	VERB 21	NOUN 22	Flashing
e.	+22500		ENTR
f.	Observe		
	VERB 22	NOUN 22	Flashing
g.	+22500		ENTR
h.	Observe		
	VERB 23	NOUN 22	Flashing
i.	+22500		ENTR
j.	VERB 16	NOUN 20	ENTR
k.	Observe		
	NO ATT lamp lights.		

17. When the DSKY registers display:
Row 1 approximately +22500
Row 2 approximately +22500
Row 3 approximately +22500
The GIMBAL LOCK lamps on the DSKYs and the Monitor panel shall be lighted. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

DATE __________

JOB OPERATE CONTROL TEST

JDC 12207 REV - PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

18. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3 DC.

b. IRIG Temperature on CHANNEL 4-3 DC.

c. IMU Heater Discrete on CHANNEL 5 AUX.

d. IMU Blower Discrete on CHANNEL 6 AUX.

19. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

20. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

21. Connect a jumper from PROBES OUTPUT, DIRECT to CH-5, IN-DC on the Auxiliary Input Panel.

22. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

23. Zero and calibrate CHANNEL 3, 4, 5, and 6 on the Oscillograph Amplifier.

24. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

25. Set the CHART SPEEDS to 1, RANGE to 20 MV/MM and CHART DRIVE to MM/SEC on the Oscillograph Control for CHANNELS 3 and 4, and to 20 V/CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 26 through 49 noting that steps 39 and 40 shall be performed 15 and 30 minutes respectively after step 31.

TURN-ON CAGE TEST

26. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00012 ENTR

27. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNELS 3 and 4. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Calculate and record the difference between the PIPA and IRIG voltage indications.

DATE __________

JOB OPERATE CONTROL TEST

JDC 12207 REV - PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The NO ATT lamp on the DSKY shall light.

31. Press the EVENT MARKER on the Oscillograph Control panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000. The NO ATT lamp shall be not lighted.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTER

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	NO ATT lamp lights		

38. Set the CROSSBAR CONTROL to 220. Adjust the G & N POWER ADJUST control until the DVM indicates 28.00 (±0.25) vdc.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

39. 15 minutes after performing step 32, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

40. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4.

PSA THERMISTOR

41. Measure the 800 CPS P/S temperature thermistor resistance across pins

DATE __________

JOB OPERATE CONTROL TEST | JDC 12207 REV - PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

TB5-12 and TB5-13 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

TEMP MON 1 THERMISTOR

42. Measure the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

PIPA CAL. MOD. THERMISTOR

43. Measure the PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2. Use a 10K ohm resistor in series with one of the measuring probes. Subtract the resistance of the 10K resistor from the measured resistance. Record indication.

IMU CAGE

44. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe
VERB 21 NOUN 22 Flashing
e. +00200 ENTR
f. Observe
VERB 22 NOUN 22 Flashing
g. +00200 ENTR
h. Observe
VERB 23 NOUN 22 Flashing
i. +00200 ENTR
j. VERB 16 NOUN 20 ENTR
k. Observe
NO ATT lamp lights

45. When the DSKY registers display
Row 1 approximately +00200
Row 2 approximately +00200
Row 3 approximately +00200

Press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel.

46. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensibility of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

47. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

48. Record the display of Row 1. Enter VERB 36 and press the ENTR pushbutton.

INERTIAL TEMPERATURE CONTROL POINT

49. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours

DATE ______

JOB OPERATE CONTROL TEST | JDC 12207 REV - PAGE 6 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

50. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 49. Calculate and record the difference.

51. Compare the PIPA temperature recorded in step 39 with the PIPA temperature recorded in step 49. Calculate and record the difference.

52. Compare the IRIG temperature recorded in step 40 with the IRIG temperature recorded in step 49. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

54. Record the maximum and minimum voltage indicated on CHANNEL 6.

MASTER ALARM TEST

55. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel and set the INTERFACE LOAD TEST selector to 1.

56. Press the TEST START pushbutton.

57. Observe and record that the MASTER ALARM pushbutton on the Indicator Control panel lights.

58. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons on the Test Selector panel. The MASTER ALARM pushbutton shall go out. Set the INTERFACE LOAD TEST selector to OFF.

MASTER ALARM RESET TEST

59. Press the CONTINUITY TEST pushbutton on the Test Selector panel and set the CONTINUITY TEST selector to 10.

60. Set the CONDITION LAMPS switch on the Indicator Control panel to TEST.

61. Press the MASTER ALARM pushbutton. Observe and record that the pushbutton lights.

62. Press the CONTINUITY TEST pushbutton on the Test Selector panel. Set the CONTINUITY TEST selector to OFF.

NORMALIZATION

63. Perform the following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR
g. Observe
NO ATT lamp lights

64. Observe that the Electro Luminescent lighting on the Indicator Control panel is lighted.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12207
REV. -
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JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION ______
TIME ______ START ______ END ______ TOTAL ELAPSED ______

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	28.55				29.05		
27	CHANNEL 3 voltage	vdc	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
28	|CH 3| - |CH 4|		▨				▨		
31	Time	hr min	▨				▨	▨	▨
32	PIPA torquing not present until after Display change	▨	▨				▨		
35	OG Gimbal position	▨	▨				▨	▨	▨
	MG Gimbal position	▨	▨				▨	▨	▨
	IG Gimbal position	▨	▨				▨	▨	▨
	OG DSKY position	▨	▨				▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. -

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35	MG DSKY position	▨	▨				▨	▨	▨
(cont)	IG DSKY position	▨	▨				▨	▨	▨
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
39	Time	min	▨				▨		
	CHANNEL 3 voltage	vdc	▨				▨		
40	Time	min	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
41	PSA temperature	ohms	1715				8370		
42	Temp Mon 1	ohms	1400				13,250		
43	PIPA Cal. Mod.	ohms	2800				13,250		
46	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12207
REV. ______

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
48	Row 1 display	▨	xxxox				xxxox		
49	CHANNEL 3 voltage	vdc	▨				▨		
	CHANNEL 4 voltage	vdc	▨				▨		
50	|Step 27| - |Step 49|	vdc	▨				▨		
51	|Step 39| - |Step 49|	vdc	▨				▨		
52	|Step 40| - |Step 49|	vdc	▨				▨		
53	ON State CHANNEL 5 voltage	vdc	27				29		
	OFF State CHANNEL 5 voltage	vdc	0.0				5.0		
54	ON State CHANNEL 6 voltage	vrms	0.0				5.0		
	OFF State CHANNEL 6 voltage	vdc	25.9				30.1		
57	MASTER ALARM lamp	▨	lights				▨		
61	MASTER ALARM lamp	▨	lights				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE ______

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV. A PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30303	6	1,4,6,7,9	EA	WS

REFERENCES

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10 AC
TRIGGER VOLTAGE fully counterclockwise
SAMPLE TIME (N_1) to 008000
FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

TIME/DIV to .1 m sec
TRIGGER to LOWER BEAM
COUPLING AC FAST to AC
SLOPE to +
LEVEL - to see trace
B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 μsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

---

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER B BUS

18. Press the following pushbuttons:

CGC/LGC POWER ON
400 CPS POWER ON
(Wait for PROCEED portion to light)
PROCEED/ISS STANDBY
OPTICS POWER ON
(Wait for PROCEED portion to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. Repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER A BUS

24. Repeat steps 18 and 19.

25. Calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 30.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV A PAGE 5 OF 6
SUBSYSTEM G & N SYSTEM | ASSY

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 volts 1% 800 cps	121
d. OPTICS 28 volts 1% 800 cps	101
e. +28 VDC Computer TP	193
f. 3.2 kcps 28 volts Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV A PAGE 6 OF 6
SUBSYSTEM G & N SYSTEM | ASSY

Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 1% 3200 cps	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. AGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps	1	008000
b. OPTX 28 V 800 cps	2	008000
c. 28 V 3.2 KC Feedback	5	032000
d. 400 cps monitor	7	004000

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12208
REV. A
INITIAL TDRR 29882

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				30.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 VAC, 1%	vac	27.44				28.56		
2.d	OPTICS 28 VAC, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				30.8		
2.f	3.2KC 28 VAC, 1% Feedback	vac	28.04				29.16		
2.g	-28 VDC	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED
**Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 10

JDC
NO. 12208
REV. A

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	26.0				30.0		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 10

JDC
NO. 12208
REV. A

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.f	3200 28 VAC, 1%**	vac	27.44				28.56		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.85				4.15		
3.j	CGC +14 VDC	vdc	13.8				14.2		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.l	IMU Operate +28 VDC **	vdc	25.8				30.8		
3.m	AGC Operate +28 VDC	vdc	25.8				30.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTX 28 V 800 cps	ratio	099875				100125		
7.c	IMU 28 V 3.2 KC	ratio	099968				100032		
7.d	115 V 400 cps	ratio	098280				101750		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	μsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 10

JDC
NO. 12208
REV. A

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
20.a	28 VDC Operate/ IMU	vdc	25.8				30.8		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				30.8		
27	28V 5% øA angle	deg	-100				-80		
29	28V 5% øB angle	deg	▨				▨		
30	Phase angle |øA-øB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC	vdc	-21.5				-33.5		
32	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 10

JDC
NO. 12208
REV. A

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
32	Z PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
32	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 10

JDC
NO. 12208
REV. A

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	3200 CPS 28 VAC 1% **	vac	27.44				28.56		
32 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
32 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTX 28 V 800 cps	ratio	099875				100125		
32 (7.c)	IMU 28 V 3.2 KC	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 10

JDC NO. 12208 REV. A

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5g ØA angle	dcg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle | ØA - ØB |	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 10

JDC NO. 12208 REV. A

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
33	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
33	X PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
33	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 10

JDC NO. 12208 REV. A

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	3200 CPS 28 VAC 1% **	vac	27.44				28.56		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
33 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTX 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC NO. 12208 REV. A

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
33 (7.c)	IMU 28 V 3.2 KC	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC +4 VDC	vdc	3.85				4.15			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC +14 VDC	vdc	13.8				14.2			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV. B PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30303	6	1,4,6,7,9	EA	WS
B	9-1-66	30924	6	-	JP	-

REFERENCES

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV B PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

- DISPLAY TIME (N_2) to 10^5
- DISPLAY RESET to ZERO
- CLOCK FREQUENCY DIVIDER to 10
- CLOCK SELECTOR to INT
- INPUT SELECTOR to C SENSE
- SENSE SELECTOR to FWD
- ATTEN to 10 AC
- TRIGGER VOLTAGE fully counterclockwise.
- SAMPLE TIME (N_1) to 008000
- FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and T31-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

- TIME/DIV to .1 m sec
- TRIGGER to LOWER BEAM
- COUPLING AC FAST to AC
- SLOPE to +
- LEVEL - to see trace
- B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 µsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV B PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

- PROCEED ISS STANDBY
- OIA ON/ISS POWER DISABLED
- OPTICS POWER ON
- CGC/LGC POWER ON
- 400 CPS POWER ON
- G/N POWER B BUS

18. Press the following pushbuttons:

- CGC/LGC POWER ON
- 400 CPS POWER ON
  (Wait for PROCEED portion to light)
- PROCEED/ISS STANDBY
- OPTICS POWER ON
  (Wait for PROCEED portion to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. Repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

- PROCEED ISS STANDBY
- OIA ON/ISS POWER DISABLED
- OPTICS POWER ON
- CGC/LGC POWER ON
- 400 CPS POWER ON
- G/N POWER A BUS

24. Repeat steps 18 and 19.

25. Calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV B PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 30.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.
In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV B PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269 220
b. 28 volts dc OPTICS	200
c. IMU 28 volts 1% 800 cps	121
d. OPTICS 28 volts 1% 800 cps	101
e. +28 VDC Computer TP	193
f. 3.2 kcps 28 volts Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV B PAGE 6 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 1% 3200 cps	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. AGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps	1	008000
b. OPTX 28 V 800 cps	2	008000
c. 28 V 3.2 KC Feedback	5	032000
d. 400 cps monitor	7	004000

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12208
REV. B
INITIAL TDRR 29882

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				30.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 VAC, 1%	vac	27.44				28.56		
2.d	OPTICS 28 VAC, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				30.8		
2.f	3.2KC 28 VAC, 1% Feedback	vac	28.04				29.16		
2.g	-28 VDC	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED

**Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 10

JDC
NO. 12208
REV. B

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	26.0				30.0		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED.

** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 10

JDC
NO. 12208
REV. B

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.f	3200 28 VAC, 1%**	vac	27.44				28.56		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.85				4.15		
3.j	CGC +14 VDC	vdc	13.8				14.2		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.l	IMU Operate +28 VDC **	vdc	25.8				30.8		
3.m	AGC Operate +28 VDC	vdc	25.8				30.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTX 28 V 800 cps	ratio	099875				100125		
7.c	IMU 28 V 3.2 KC	ratio	099968				100032		
7.d	115 V 400 cps	ratio	098280				101750		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	μsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 10

JDC
NO. 12208
REV. B

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
20.a	28 VDC Operate/ IMU	vdc	25.8				30.8		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				30.8		
27	28V 5% ØA angle	deg	-100				-80		
29	28V 5% ØB angle	deg	▨				▨		
30	Phase angle |ØA-ØB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC	vdc	-21.5				-33.5		
32	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 10

JDC
NO. 12208
REV. B

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
32	Z PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
32	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 10

JDC
NO. 12208
REV. B

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	3200 CPS 28 VAC 1% **	vac	27.44				28.56		
32 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
32 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTX 28 V 800 cps	ratio	099875				100125		
32 (7.c)	IMU 28 V 3.2 KC	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 10

JDC
NO. 12208
REV. B

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5g ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle | ØA - ØB |	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 10

JDC
NO. 12208
REV. B

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
33	X PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
33	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 10

JDC
NO. 12208
REV. B

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	3200 CPS 28 VAC 1% **	vac	27.44				28.56		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
33 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTX 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC
NO. 12208
REV. B

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC	
				1st	2nd*	3rd*				
33 (7.c)	IMU 28 V 3.2 KC	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC +4 VDC	vdc	3.85				4.15			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC + 14 VDC	vdc	13.8				14.2			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV. C PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30303	6	1,4,6,7,9	EA	WS
B	9-1-66	30924	6	-	JP	-
C	9-15-66	31050	-	1 - 9	EA	-

REFERENCES

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV C PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10 AC
TRIGGER VOLTAGE fully counterclockwise
SAMPLE TIME (N_1) to 008000
FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

TIME/DIV to .1 m sec
TRIGGER to LOWER BEAM
COUPLING AC FAST to AC
SLOPE to +
LEVEL - to see trace
B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 μsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV C PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER B BUS

18. Press the following pushbuttons:

CGC/LGC POWER ON
400 CPS POWER ON
(Wait for PROCEED portion to light)
PROCEED/ISS STANDBY
OPTICS POWER ON
(Wait for PROCEED portion to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. Repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER A BUS

24. Repeat steps 18 and 19.

25. Calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV C PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 30.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

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45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 volts 1% 800 cps	121
d. OPTICS 28 volts 1% 800 cps	101
e. +28 VDC Computer TP	193
f. 3.2 kcps 28 volts Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

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Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 1% 3200 cps	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. AGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps	1	008000
b. OPTX 28 V 800 cps	2	008000
c. 28 V 3.2 KC Feedback	5	032000
d. 400 cps monitor	7	004000

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12208
REV. C
INITIAL TDRR 29882

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE

NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269)	vdc	25.8				30.8		
	OPERATE/IMU (220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 VAC, 1%	vac	27.44				28.56		
2.d	OPTICS 28 VAC, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				30.8		
2.f	3.2KC 28 VAC, 1% Feedback	vac	28.04				29.16		
2.g	-28 VDC	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED

**Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 10

JDC
NO. 12208
REV. C

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	26.0				30.0		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED.

** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 10

JDC
NO. 12208
REV. C

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.f	3200 28 VAC, 1%**	vac	27.44				28.56		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.85				4.15		
3.j	CGC +14 VDC	vdc	13.8				14.2		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.l	IMU Operate +28 VDC **	vdc	25.8				30.8		
3.m	AGC Operate +28 VDC	vdc	25.8				30.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTX 28 V 800 cps	ratio	099875				100125		
7.c	IMU 28 V 3.2 KC	ratio	099968				100032		
7.d	115 V 400 cps	ratio	098280				101750		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	µsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

DATE 30 JUN 66

FORM 00147
Chg. 7-13-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 10

JDC
NO. 12208
REV. C

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
20.a	28 VDC Operate/ IMU	vdc	25.8				30.8		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				30.8		
27	28V 5% ϕA angle	deg	-100				-80		
29	28V 5% ϕB angle	deg	▨				▨		
30	Phase angle |ϕA-ϕB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC	vdc	-21.5				-33.5		
32 (2.h)	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

DATE 30 JUN 66

FORM 00147
Chg. 7-28-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 10

JDC
NO. 12208
REV. C

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (2.i)	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32 (2.n)	X PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.o)	Z PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.p)	Y PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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JDC
NO. 12208
REV. C

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	3200 CPS 28 VAC 1% **	vac	27.44				28.56		
32 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
32 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTX 28 V 800 cps	ratio	099875				100125		
32 (7.c)	IMU 28 V 3.2 KC	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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EQUIPMENT TEST
DATA SHEET 7 OF 10

JDC
NO. 12208
REV. C

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5% ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle |ØA - ØB|	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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JDC
NO. 12208
REV. C

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
33	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
33	X PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
33	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC19104 where applicable.

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JDC
NO. 12208
REV. C

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	3200 CPS 28 VAC 1% **	vac	27.44				28.56		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
33 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTX 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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JDC
NO. 12208
REV. C

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
33 (7.c)	IMU 28 V 3.2 KC	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle |ØA - ØB|	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC +4 VDC	vdc	3.85				4.15			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC +14 VDC	vdc	13.8				14.2			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

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JOB G & N SYSTEM POWER SUPPLIES TEST INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30303	6	1,4,6,7,9	EA	WS
B	9-1-66	30924	6	-	JP	-
C	9-15-66	31050	-	1 - 9	EA	-
D	11-10-66	31887	1,4	-	EA	-

REFERENCES

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition. Press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM POWER SUPPLIES TEST JDC 12208 REV D PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM ASSY

3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

- DISPLAY TIME (N_2) to 10^5
- DISPLAY RESET to ZERO
- CLOCK FREQUENCY DIVIDER to 10
- CLOCK SELECTOR to INT
- INPUT SELECTOR to C SENSE
- SENSE SELECTOR to FWD
- ATTEN to 10 AC
- TRIGGER VOLTAGE fully counterclockwise
- SAMPLE TIME (N_1) to 008000
- FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

- TIME/DIV to .1 m sec
- TRIGGER to LOWER BEAM
- COUPLING AC FAST to AC
- SLOPE to +
- LEVEL - to see trace
- B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 μsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

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JOB G & N SYSTEM POWER SUPPLIES TEST JDC 12208 REV D PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM ASSY

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

- PROCEED ISS STANDBY
- OIA ON/ISS POWER DISABLED
- OPTICS POWER ON
- CGC/LGC POWER ON
- 400 CPS POWER ON
- G/N POWER B BUS

18. Press the following pushbuttons:

- CGC/LGC POWER ON
- 400 CPS POWER ON (Wait for PROCEED portion to light)
- PROCEED/ISS STANDBY
- OPTICS POWER ON (Wait for PROCEED portion to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. Repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

- PROCEED ISS STANDBY
- OIA ON/ISS POWER DISABLED
- OPTICS POWER ON
- CGC/LGC POWER ON
- 400 CPS POWER ON
- G/N POWER A BUS

24. Repeat steps 18 and 19.

25. Calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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JOB G & N SYSTEM POWER SUPPLIES TEST JDC 12208 REV D PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM ASSY

31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 30.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

33A. Press OPTICS POWER ON pushbutton on the Test Control panel and the OPTICS POWER ON pushbutton shall go out.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to

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SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 volts 1% 800 cps	121
d. OPTICS 28 volts 1% 800 cps	101
e. +28 VDC Computer TP	193
f. 3.2 kcps 28 volts Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 1% 3200 cps	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. AGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps	1	008000
b. OPTX 28 V 800 cps	2	008000
c. 28 V 3.2 KC Feedback	5	032000
d. 400 cps monitor	7	004000

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC NO. 12208
REV. D
INITIAL TDRR 29832

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST
TITLE ____________
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____________ SER. NO. ______ CAL DATE ______
NAME ____________ SER. NO. ______ CAL DATE ______

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				30.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 VAC, 1%	vac	27.44				28.56		
2.d	OPTICS 28 VAC, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				30.8		
2.f	3.2KC 28 VAC, 1% Feedback	vac	28.04				29.16		
2.g	-28 VDC	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED

**Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 10

JDC NO. 12208
REV. D

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	26.0				30.0		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED.

** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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EQUIPMENT TEST
DATA SHEET 3 **OF** 10

JDC
NO. 12208
REV. D

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
3.f	3200 28 VAC, 1%**	vac	27.44				28.56		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.85				4.15		
3.j	CGC +14 VDC	vdc	13.8				14.2		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.l	IMU Operate +28 VDC **	vdc	25.8				30.8		
3.m	AGC Operate +28 VDC	vdc	25.8				30.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTX 28 V 800 cps	ratio	099875				100125		
7.c	IMU 28 V 3.2 KC	ratio	099968				100032		
7.d	115 V 400 cps	ratio	098280				101750		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	μsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 10

JDC
NO. 12208
REV. D

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
20.a	28 VDC Operate/ IMU	vdc	25.8				30.8		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				30.8		
27	28V 5% ØA angle	deg	-100				-80		
29	28V 5% ØB angle	deg	▨				▨		
30	Phase angle |ØA-ØB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC	vdc	-21.5				-33.5		
32 (2.h)	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 **OF** 10

JDC
NO. 12208
REV. D

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
32	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
32	Z PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
32	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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EQUIPMENT TEST
DATA SHEET 6 **OF** 10

JDC
NO. 12208
REV. D

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	3200 CPS 28 VAC 1% **	vac	27.44				28.56		
32 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
32 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTX 28 V 800 cps	ratio	099875				100125		
32 (7.c)	IMU 28 V 3.2 KC	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 10

JDC
NO. 12208
REV. D

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5g ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle | ØA - ØB |	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 10

JDC
NO. 12208
REV. D

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
33	X PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
33	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC19104 where applicable.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 10

JDC
NO. 12208
REV. D

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	3200 CPS 28 VAC 1% **	vac	27.44				28.56		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
33 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTX 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value. Use multiplier factors determined from latest calibration per JDC 19104 where applicable.

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EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC
NO. 12208
REV. D

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC	
				1st	2nd*	3rd*				
33 (7.c)	IMU 28 V 3.2 KC	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC + 4 VDC	vdc	3.85				4.15			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC + 14 VDC	vdc	13.8				14.2			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

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INITIAL TDRR 29882 D.S. PGS 10

JOB G & N SYSTEM POWER SUPPLIES TEST

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30303	6	1,4,6,7,9	EA	WS
B	9-1-66	30924	6	-	JP	-
C	9-15-66	31050	-	1 - 9	EA	-
D	11-10-66	31887	1,4	-	EA	-
E	11-15-66	31941	1,3	1 - 9	EA	-

REFERENCES

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition in accordance with JDC 12215. Press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB G & N SYSTEM POWER SUPPLIES TEST JDC 12208 REV E PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM ASSY

3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10 AC
TRIGGER VOLTAGE fully counterclockwise
SAMPLE TIME (N_1) to 008000
FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

TIME/DIV to .1 m sec
TRIGGER to LOWER BEAM
COUPLING AC FAST to AC
SLOPE to +
LEVEL - to see trace
B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 µsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

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JOB G & N SYSTEM POWER SUPPLIES TEST JDC 12208 REV E PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM ASSY

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER B BUS

18. Press the following pushbuttons:

CGC/LGC POWER ON
400 CPS POWER ON
(Wait for PROCEED portion to light)
PROCEED/ISS STANDBY
OPTICS POWER ON
(Wait for PROCEED portion to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. After 90 seconds have elapsed, repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER A BUS

24. Repeat steps 18 and 19.

25. After 90 seconds have elapsed, calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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JOB G & N SYSTEM POWER SUPPLIES TEST JDC 12208 REV E PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM ASSY

31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 30.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

33A. Press OPTICS POWER ON pushbutton on the Test Control panel and the OPTICS POWER ON pushbutton shall go out.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to

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JOB G & N SYSTEM POWER SUPPLIES TEST	JDC 12208 REV E PAGE 5 OF 6
SUBSYSTEM G & N SYSTEM	ASSY

SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 volts 1% 800 cps	121
d. OPTICS 28 volts 1% 800 cps	101
e. +28 VDC Computer TP	193
f. 3.2 kcps 28 volts Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

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JOB G & N SYSTEM POWER SUPPLIES TEST	JDC 12208 REV E PAGE 6 OF 6
SUBSYSTEM G & N SYSTEM	ASSY

Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 1% 3200 cps	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. AGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps	1	008000
b. OPTX 28 V 800 cps	2	008000
c. 28 V 3.2 KC Feedback	5	032000
d. 400 cps monitor	7	004000

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12208
REV. E
INITIAL TDRR 29882

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ____ CAL DATE

NAME ________ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				30.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 VAC, 1%	vac	27.44				28.56		
2.d	OPTICS 28 VAC, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				30.8		
2.f	3.2KC 28 VAC, 1% Feedback	vac	28.04				29.16		
2.g	-28 VDC **	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED

**Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 10

JDC
NO. 12208
REV. E

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	26.0				30.0		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED.

** Correct this measurement using "MULT BY" factor to obtain the true value.

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EQUIPMENT TEST
DATA SHEET 3 OF 10

JDC
NO. 12208
REV. E

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.f	3200 28 VAC, 1%**	vac	27.7				29.5		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.85				4.15		
3.j	CGC +14 VDC	vdc	13.8				14.2		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.1	IMU Operate +28 VDC **	vdc	25.8				30.8		
3.m	AGC Operate +28 VDC	vdc	25.8				30.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTX 28 V 800 cps	ratio	099875				100125		
7.c	IMU 28 V 3.2 KC	ratio	099968				100032		
7.d	115 V 400 cps	ratio	098280				101750		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	μsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 10

JDC
NO. 12208
REV. E

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
20.a	28 VDC (269)	vdc	25.8				30.8		
	Operate/IMU(220)	vdc	27.75				28.25		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				30.8		
27	28V 5% ØA angle	deg	-100				-80		
29	28V 5% ØB angle	deg	▨				▨		
30	Phase angle |ØA-ØB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
32 (2.h)	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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EQUIPMENT TEST
DATA SHEET 5 OF 10

JDC
NO. 12208
REV. E

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
32	Z PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
32	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
NO. 12208
REV. E

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	3200 CPS 28 VAC 1% **	vac	27.7				29.5		
32 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
32 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTX 28 V 800 cps	ratio	099875				100125		
32 (7.c)	IMU 28 V 3.2 KC	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
NO. 12208
REV. E

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5g ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle | ØA - ØB |	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
33	X PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
33	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	3200 CPS 28 VAC 1% **	vac	27.7				29.5		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
33 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTX 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC	
				1st	2nd*	3rd*				
33 (7.c)	IMU 28 V 3.2 KC	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC +4 VDC	vdc	3.85				4.15			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC +14 VDC	vdc	13.8				14.2			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV. F PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

	Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		
				JDC	D.S.	M/T	NASA	
M	A	7-28-66	30303	6	1,4,6,7,9	EA	WS	REFERENCES
M	B	9-1-66	30924	6	-	JP	-	
M	C	9-15-66	31050	-	1 - 9	EA	-	IMPORTANT See Below
M	D	11-10-66	31887	1,4	-	EA	-	
M	E	11-15-66	31941	1,3	1 - 9	EA	-	
	F	1-26-67	32760	1	3	EA	-	INTERVAL
								TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value. The "MULT BY" factors can be found on the GSE Signal Selection List, part number 2901077.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition in accordance with JDC 12216. Press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV F PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

- DISPLAY TIME (N_2) to 10^5
- DISPLAY RESET to ZERO
- CLOCK FREQUENCY DIVIDER to 10
- CLOCK SELECTOR to INT
- INPUT SELECTOR to C SENSE
- SENSE SELECTOR to FWD
- ATTEN to 10 AC
- TRIGGER VOLTAGE fully counterclockwise
- SAMPLE TIME (N_1) to 008000
- FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

- TIME/DIV to .1 m sec
- TRIGGER to LOWER BEAM
- COUPLING AC FAST to AC
- SLOPE to +
- LEVEL - to see trace
- B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 µsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV F PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

- PROCEED ISS STANDBY
- OIA ON/ISS POWER DISABLED
- OPTICS POWER ON
- CGC/LGC POWER ON
- 400 CPS POWER ON
- G/N POWER B BUS

18. Press the following pushbuttons:

- CGC/LGC POWER ON
- 400 CPS POWER ON (Wait for PROCEED portion to light)
- PROCEED/ISS STANDBY
- OPTICS POWER ON (Wait for PROCEED portion to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. After 90 seconds have elapsed, repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

- PROCEED ISS STANDBY
- OIA ON/ISS POWER DISABLED
- OPTICS POWER ON
- CGC/LGC POWER ON
- 400 CPS POWER ON
- G/N POWER A BUS

24. Repeat steps 18 and 19.

25. After 90 seconds have elapsed, calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV F PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 30.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

33A. Press OPTICS POWER ON pushbutton on the Test Control panel and the OPTICS POWER ON pushbutton shall go out.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV F PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 volts 1% 800 cps	121
d. OPTICS 28 volts 1% 800 cps	101
e. +28 VDC Computer TP	193
f. 3.2 kcps 28 volts Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

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Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 1% 3200 cps	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. AGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps	1	008000
b. OPTX 28 V 800 cps	2	008000
c. 28 V 3.2 KC Feedback	5	032000
d. 400 cps monitor	7	004000

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EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC NO. 12208
REV. F
INITIAL TDRR 29882

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ ____ CAL DATE
NAME ____ SER. NO. ____ ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269)	vdc	25.8				30.8		
	OPERATE/IMU (220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 VAC, 1%	vac	27.44				28.56		
2.d	OPTICS 28 VAC, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				30.8		
2.f	3.2KC 28 VAC, 1% Feedback	vac	28.04				29.16		
2.g	-28 VDC **	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED

**Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 10

JDC NO. 12208
REV. F

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	26.0				30.0		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 10

JDC NO. 12208
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.f	3200 28 VAC, 1%**	vac	27.7				29.5		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.85				4.15		
3.j	CGC +14 VDC	vdc	13.8				14.2		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.l	IMU Operate +28 VDC **	vdc	25.8				30.8		
3.m	AGC Operate +28 VDC	vdc	25.8				30.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTX 28 V 800 cps	ratio	099875				100125		
7.c	IMU 28 V 3.2 KC	ratio	099968				100032		
7.d	115 V 400 cps	ratio	095000				105000		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	μsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC NO. 12208
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
20.a	28 VDC (269)	vdc	25.8				30.8		
	Operate/IMU(220)	vdc	27.75				28.25		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				30.8		
27	28V 5% ØA angle	deg	-100				-80		
29	28V 5% ØB angle	deg	▨				▨		
30	Phase angle |ØA-ØB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
32	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC NO. 12208
REV. F

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
32	Z PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
32	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
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JDC NO. 12208
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	3200 CPS 28 VAC 1% **	vac	27.7				29.5		
32 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
32 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTX 28 V 800 cps	ratio	099875				100125		
32 (7.c)	IMU 28 V 3.2 KC	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
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JDC
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5g ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle |ØA - ØB|	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
33	X PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
33	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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REV. F

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	3200 CPS 28 VAC 1% **	vac	27.7				29.5		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
33 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTX 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
NO. 12208
REV. F

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC	
				1st	2nd*	3rd*				
33 (7.c)	IMU 28 V 3.2 KC	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle |ØA - ØB|	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC +4 VDC	vdc	3.85				4.15			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC + 14 VDC	vdc	13.8				14.2			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV. G PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS. 10

SUBSYSTEM G & N SYSTEM | ASSY.
DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30303	6	1,4,6,7,9	EA	WS
B	9-1-66	30924	6	-	JP	-
C	9-15-66	31050	-	1 - 9	EA	-
D	11-10-66	31887	1,4	-	EA	-
E	11-15-66	31941	1,3	1 - 9	EA	-
F	1-26-67	32760	1	3	EA	-
G	6-6-67	33908	3,5,6	All	EA	-

REFERENCES

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value. The "MULT BY" factors can be found on the GSE Signal Selection List, part number 2901077.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition in accordance with JDC 12215. Press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV G PAGE 2 OF 6
SUBSYSTEM G & N SYSTEM | ASSY

3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10 AC
TRIGGER VOLTAGE fully counterclockwise
SAMPLE TIME (N_1) to 008000
FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

TIME/DIV to .1 m sec
TRIGGER to LOWER BEAM
COUPLING AC FAST to AC
SLOPE to +
LEVEL - to see trace
B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 µsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV G PAGE 3 OF 6
SUBSYSTEM G & N SYSTEM | ASSY

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER B BUS

18. Press the following pushbuttons:

CGC/LGC POWER ON
400 CPS POWER ON
(Insure that PROCEED portion of PROCEED/ISS STANDBY is lighted)
PROCEED/ISS STANDBY
OPTICS POWER ON
(Wait for PROCEED portion of PROCEED/ISS OPERATE to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. After 90 seconds have elapsed, repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER A BUS

24. Repeat steps 18 and 19.

25. After 90 seconds have elapsed, calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV G PAGE 4 OF 6
SUBSYSTEM G & N SYSTEM | ASSY

31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 30.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

33A. Press OPTICS POWER ON pushbutton on the Test Control panel and the OPTICS POWER ON pushbutton shall go out.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV G PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 V 800 cps 1%	121
d. OPTICS 28 V 800 cps 1%	101
e. +28 VDC Computer TP	193
f. 28 V 3200 cps Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV G PAGE 6 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 3200 cps 1%	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. CGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps 1%	1	008000
b. OPTICS 28 V 800 cps 1%	2	008000
c. 28 V 3200 cps Feedback	5	032000
d. 115 V 400 cps	7	004000

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12208
REV. G
INITIAL TDRR 29862

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				31.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 V 800 cps, 1%	vac	27.44				28.56		
2.d	OPTICS 28 V 800 cps, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				31.8		
2.f	28 V 3200 cps, Feedback	vac	28.04				29.16		
2.g	-28 VDC **	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED

**Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 10

JDC
NO. 12208
REV. G

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	25.9				30.1		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED

** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 10

JDC
NO. 12208
REV. G

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.f	28 V 3200 cps, 1%**	vac	27.7				29.5		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.85				4.15		
3.j	CGC +14 VDC	vdc	13.8				14.2		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.l	IMU Operate +28 VDC**	vdc	25.8				31.8		
3.m	+28 VDC COMPUTER TP	vdc	25.8				31.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTICS 28 V 800 cps	ratio	099875				100125		
7.c	28 V 3200 cps Feedback	ratio	099968				100032		
7.d	115 V 400 cps	ratio	095000				105000		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	μsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

FORM 0917
New 9-30-65

APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12208
REV. G

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
20.a	28 VDC (269)	vdc	25.8				31.8		
	Operate/IMU(220)	vdc	27.75				28.25		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				31.8		
27	28V 5% ØA angle	deg	-100				-80		
29	28V 5% ØB angle	deg	▨				▨		
30	Phase angle |ØA-ØB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
32 (2.h)	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

FORM 0917
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 10

JDC
NO. 12208
REV. G

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (2.i)	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

FORM 0917
New 9-30-65

APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12208
REV. G

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
32 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
32 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTICS 28 V 800 cps	ratio	099875				100125		
32 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 10

JDC
NO. 12208
REV. G

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5% ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle | ØA - ØB |	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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FORM 00147
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 8 OF 10

JDC
NO. 12208
REV. G

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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[illegible]

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 10

JDC
NO. 12208
REV. G

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
33 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTICS 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC
NO. 12208
REV. G

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC	
				1st	2nd*	3rd*				
33 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC + 4 VDC	vdc	3.85				4.15			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC + 14 VDC	vdc	13.8				14.2			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

DATE 30 JUN 66

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JOB G & N SYSTEM POWER SUPPLIES TEST

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INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	7-28-66	30303	6	1,4,6,7,9	EA	WS	
B	9-1-66	30924	6	-	JP	-	
C	9-15-66	31050	-	1 - 9	EA	-	IMPORTANT See Below
D	11-10-66	31887	1,4	-	EA	-	
E	11-15-66	31941	1,3	1 - 9	EA	-	
F	1-26-67	32760	1	3	EA	-	INTERVAL
G	6-6-67	33908	3,5,6	All	EA	-	
H	7-20-67	34179	5	-	SB	-	TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value. The "MULT BY" factors can be found on the GSE Signal Selection List, part number 2901077.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition in accordance with JDC 12215. Press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC 12208 REV H PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10 AC
TRIGGER VOLTAGE fully counterclockwise
SAMPLE TIME (N_1) to 008000
FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

TIME/DIV to .1 m sec
TRIGGER to LOWER BEAM
COUPLING AC FAST to AC
SLOPE to +
LEVEL - to see trace
B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 µsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC 12208 REV H PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER B BUS

18. Press the following pushbuttons:

CGC/LGC POWER ON
400 CPS POWER ON
(Insure that PROCEED portion of PROCEED/ISS STANDBY is lighted)
PROCEED/ISS STANDBY
OPTICS POWER ON
(Wait for PROCEED portion of PROCEED/ISS OPERATE to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. After 90 seconds have elapsed, repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER A BUS

24. Repeat steps 18 and 19.

25. After 90 seconds have elapsed, calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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JOB G & N SYSTEM POWER SUPPLIES TEST

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SUBSYSTEM G & N SYSTEM

ASSY

31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 30.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

33A. Press OPTICS POWER ON pushbutton on the Test Control panel and the OPTICS POWER ON pushbutton shall go out.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to

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SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269 220
b. 28 volts dc OPTICS	200
c. IMU 28 V 800 cps 1%	121
d. OPTICS 28 V 800 cps 1%	101
e. +28 VDC Computer TP	193
f. 28 V 3200 cps Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
*k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

*When recording the CDU +4 volts dc noise measurement ignore spike levels appearing at a rate of 120 cps.

Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 3200 cps 1%	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. CGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps 1%	1	008000
b. OPTICS 28 V 800 cps 1%	2	008000
c. 28 V 3200 cps Feedback	5	032000
d. 115 V 400 cps	7	004000

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12208
REV. H
INITIAL TDRR 29882

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				31.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 V 800 cps, 1%	vac	27.44				28.56		
2.d	OPTICS 28 V 800 cps, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				31.8		
2.f	28 V 3200 cps, Feedback	vac	28.04				29.16		
2.g	-28 VDC **	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED

**Correct this measurement using "MULT BY" factor to obtain the true value.

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 10

JDC
NO. 12208
REV. H

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	25.9				30.1		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED

** Correct this measurement using "MULT BY" factor to obtain the true value.

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 10

JDC
NO. 12208
REV. H

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
3.f	28 V 3200 cps, 1%**	vac	27.7				29.5		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.85				4.15		
3.j	CGC +14 VDC	vdc	13.8				14.2		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.l	IMU Operate +28 VDC**	vdc	25.8				31.8		
3.m	+28 VDC COMPUTER TP	vdc	25.8				31.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWL #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTICS 28 V 800 cps	ratio	099875				100125		
7.c	28 V 3200 cps Feedback	ratio	099968				100032		
7.d	115 V 400 cps	ratio	095000				105000		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	μsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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EQUIPMENT TEST
DATA SHEET 4 OF 10

JDC
NO. 12208
REV. H

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
20.a	28 VDC (269)	vdc	25.8				31.8		
	Operate/IMU(220)	vdc	27.75				26.25		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				31.8		
27	28V 5% ØA angle	deg	-100				-80		
29	28V 5% ØB angle	deg	▨				▨		
30	Phase angle |ØA-ØB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
32 (2.h)	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 10

JDC
NO. 12208
REV. H

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
32 (2.i)	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
NO. 12208
REV. H

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
32 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
32 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTICS 28 V 800 cps	ratio	099875				100125		
32 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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EQUIPMENT TEST
DATA SHEET 7 OF 10

JDC
NO. 12208
REV. H

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5% ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle | ØA - ØB |	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
NO. 12208
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
33	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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FORM 00151
New 5-20-65

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EQUIPMENT TEST
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JDC
NO. 12208
REV. H

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
33 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTICS 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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FORM 00147
Chg 7-21-65

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EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC
NO. 12208
REV. H

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
33 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC +4 VDC	vdc	3.85				4.15			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC +14 VDC	vdc	13.8				14.2			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

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FORM 00147
Chg 7-21-65

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV. J PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	M/T	NASA
A	7-28-66	30303	6	1,4,6,7,9	EA	WS
B	9-1-66	30924	6	-	JP	-
C	9-15-66	31050	-	1 - 9	EA	-
D	11-10-66	31887	1,4	-	EA	-
E	11-15-66	31941	1,3	1 - 9	EA	-
F	1-26-67	32760	1	3	EA	-
G	6-6-67	33908	3,5,6	All	EA	-
H	7-20-67	34179	5	-	SB	-
J	11-30-67	35184	4	-	EA	-

REFERENCES

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value. The "MULT BY" factors can be found on the GSE Signal Selection List, part number 2901077.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition in accordance with JDC 12215. Press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

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3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10 AC
TRIGGER VOLTAGE fully counterclockwise
SAMPLE TIME (N_1) to 008000
FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

TIME/DIV to .1 m sec
TRIGGER to LOWER BEAM
COUPLING AC FAST to AC
SLOPE to +
LEVEL - to see trace
B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 µsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

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16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER B BUS

18. Press the following pushbuttons:

CGC/LGC POWER ON
400 CPS POWER ON
(Insure that PROCEED portion of PROCEED/ISS STANDBY is lighted)
PROCEED/ISS STANDBY
OPTICS POWER ON
(Wait for PROCEED portion of PROCEED/ISS OPERATE to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. After 90 seconds have elapsed, repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER A BUS

24. Repeat steps 18 and 19.

25. After 90 seconds have elapsed, calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 31.8 (+0.25,-0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

33A. Press OPTICS POWER ON pushbutton on the Test Control panel and the OPTICS POWER ON pushbutton shall go out.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV J PAGE 5 OF 6
SUBSYSTEM G & N SYSTEM | ASSY

SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 V 800 cps 1%	121
d. OPTICS 28 V 800 cps 1%	101
e. +28 VDC Computer TP	193
f. 28 V 3200 cps Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
*k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

*When recording the CDU +4 volts dc noise measurement ignore spike levels appearing at a rate of 120 cps.

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Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 3200 cps 1%	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. CGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps 1%	1	008000
b. OPTICS 28 V 800 cps 1%	2	008000
c. 28 V 3200 cps Feedback	5	032000
d. 115 V 400 cps	7	004000

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12208
REV. J
INITIAL TDRR 29882

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE ____________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ ______ ______
START END SITE / LOCATION
TIME ______ ______ ______
START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ ______ CAL DATE
NAME ____________ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				31.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 V 800 cps, 1%	vac	27.44				28.56		
2.d	OPTICS 28 V 800 cps, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				31.8		
2.f	28 V 3200 cps, Feedback	vac	28.04				29.16		
2.g	-28 VDC **	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED
**Correct this measu ement using "MULT BY" factor to obtain the true value.

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EQUIPMENT TEST
DATA SHEET 2 OF 10

JDC
NO. 12208
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	25.9				30.1		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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FORM 0015.1
New 9-30-65

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JDC
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.f	28 V 3200 cps, 1%**	vac	27.7				29.5		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.85				4.15		
3.j	CGC +14 VDC	vdc	13.8				14.2		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.l	IMU Operate +28 VDC**	vdc	25.8				31.8		
3.m	+28 VDC COMPUTER TP	vdc	25.8				31.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTICS 28 V 800 cps	ratio	099875				100125		
7.c	28 V 3200 cps Feedback	ratio	099968				100032		
7.d	115 V 400 cps	ratio	095000				105000		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	μsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
NO. 12208
REV. J

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
20.a	28 VDC (269)	vdc	25.8				31.8		
	Operate/IMU(220)	vdc	27.75				28.25		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				31.8		
27	28V 5% ØA angle	deg	-100				-80		
29	28V 5% ØB angle	deg	▨				▨		
30	Phase angle |ØA-ØB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
32 (2.h)	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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EQUIPMENT TEST
DATA SHEET 5 OF 10

JDC
NO. 12208
REV. J

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (2.i)	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
NO. 12208
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
32 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
32 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTICS 28 V 800 cps	ratio	099875				100125		
32 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC	
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REV.	J

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5% ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle | ØA - ØB |	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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FORM 00147
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
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JDC	
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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FORM [illegible]
[illegible]

APOLLO G&N
EQUIPMENT TEST
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JDC	
NO.	12208
REV.	J

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.2		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
33 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTICS 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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EQUIPMENT TEST
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JDC	
NO.	12208
REV.	J

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC	
				1st	2nd*	3rd*				
33 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC +4 VDC	vdc	3.85				4.15			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC + 14 VDC	vdc	13.8				14.2			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

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INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	7-28-66	30303	6	1,4,6,7,9	EA	WS	
B	9-1-66	30924	6	-	JP	-	
C	9-15-66	31050	-	1 - 9	EA	-	IMPORTANT See Below
D	11-10-66	31887	1,4	-	EA	-	
E	11-15-66	31941	1,3	1 - 9	EA	-	
F	1-26-67	32760	1	3	EA	-	INTERVAL
G	6-6-67	33908	3,5,6	All	EA	-	
H	7-20-67	34179	5	-	SB	-	TOOLS AND MATERIAL
J	11-30-67	35184	4	-	EA	-	
K	2-29-68	35770	3,4	1,3-10	EA	-	

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value. The "MULT BY" factors can be found on the GSE Signal Selection List, part number 2901077.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition in accordance with JDC 12215. Press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10 AC
TRIGGER VOLTAGE fully counterclockwise
SAMPLE TIME (N_1) to 008000
FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

TIME/DIV to .1 m sec
TRIGGER to LOWER BEAM
COUPLING AC FAST to AC
SLOPE to +
LEVEL - to see trace
B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 µsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

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16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17.

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED/ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER B BUS

NOTE: If necessary, press RSET pushbutton on DSKY and RESET pushbutton on Programmer and Monitor panel to clear alarm indications that may occur in step 18.

18. Press the following pushbuttons:

CGC/LGC POWER ON
400 CPS POWER ON
(Insure that PROCEED portion of PROCEED/ISS STANDBY is lighted)
PROCEED/ISS STANDBY
OPTICS POWER ON
(Wait for PROCEED portion of PROCEED/ISS OPERATE to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. After 90 seconds have elapsed, repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED/ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER A BUS

24. Repeat steps 18 and 19.

25. After 90 seconds have elapsed, calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 31.8 (+0.25,-0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

33A. Press OPTICS POWER ON pushbutton on the Test Control panel and the OPTICS POWER ON pushbutton shall go out.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV K PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 V 800 cps 1%	121
d. OPTICS 28 V 800 cps 1%	101
e. +28 VDC Computer TP	193
f. 28 V 3200 cps Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
*k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

*When recording the CDU +4 volts dc noise measurement ignore spike levels appearing at a rate of 120 cps.

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Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 3200 cps 1%	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. CGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps 1%	1	008000
b. OPTICS 28 V 800 cps 1%	2	008000
c. 28 V 3200 cps Feedback	5	032000
d. 115 V 400 cps	7	004000

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REV. K
INITIAL TDRR 29882

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
	*			1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				31.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 V 800 cps, 1%	vac	27.44				28.56		
2.d	OPTICS 28 V 800 cps, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				31.8		
2.f	28 V 3200 cps, Feedback	vac	28.04				29.16		
2.g	-28 VDC **	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.6				14.4		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED

**Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	25.9				30.1		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED

** Correct this measurement using "MULT BY" factor to obtain the true value.

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EQUIPMENT TEST
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
3.f	28 V 3200 cps, 1%**	vac	27.7				29.5		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.8				4.2		
3.j	CGC +14 VDC	vdc	13.6				14.4		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.l	IMU Operate +28 VDC**	vdc	25.8				31.8		
3.m	+28 VDC COMPUTER TP	vdc	25.8				31.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTICS 28 V 800 cps	ratio	099875				100125		
7.c	28 V 3200 cps Feedback	ratio	099968				100032		
7.d	115 V 400 cps	ratio	095000				105000		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	μsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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JOB G & N SYSTEM POWFR SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
20.a	28 VDC (269)	vdc	25.8				31.8		
	Operate/IMU(220)	vdc	27.75				28.25		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				31.8		
27	28V 5% ϕA angle	deg	-100				-80		
29	28V 5% ϕB angle	deg	▨				▨		
30	Phase angle |ϕA-ϕB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
32 (2.h)	CGC +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
32	CGC +14 VDC	vdc	13.6				14.4		
(2.i)	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
32 (3.g)	+20 VDC (IRIG)	vdc	18.5				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.8				4.2		
32 (3.j)	CGC +14 VDC	vdc	13.6				14.4		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTICS 28 V 800 cps	ratio	099875				100125		
32 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5% ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle | ØA - ØB |	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.8				4.2		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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REV. K

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33	CGC +14 VDC	vdc	13.6				14.4		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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JDC
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JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.8		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.8				4.2		
33 (3.j)	CGC +14 VDC	vdc	13.6				14.4		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTICS 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 6[illegible]

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC
NO. 12208
REV. K

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC	
				1st	2nd*	3rd*				
33 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC +4 VDC	vdc	3.8				4.2			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC + 14 VDC	vdc	13.6				14.4			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV. L PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	M/T	NASA
A	7-28-66	30303	6	1,4,6,7,9	EA	WS
B	9-1-66	30924	6	-	JP	-
C	9-15-66	31050	-	1 - 9	EA	-
D	11-10-66	31887	1,4	-	EA	-
E	11-15-66	31941	1,3	1 - 9	EA	-
F	1-26-67	32760	1	3	EA	-
G	6-6-67	33908	3,5,6	All	EA	-
H	7-20-67	34179	5	-	SB	-
J	11-30-67	35184	4	-	EA	-
K	2-29-68	35770	3,4	1,3-10	EA	-
L	3-19-68	35889	2-5	4	EA	-

REFERENCES

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value. The "MULT BY" factors can be found on the GSE Signal Selection List, part number 2901077.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition in accordance with JDC 12215. Press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV L PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes. Record indications.

4. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10 AC
TRIGGER VOLTAGE fully counterclockwise
SAMPLE TIME (N_1) to 008000
FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3. Record indications.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

TIME/DIV to .1 m sec
TRIGGER to LOWER BEAM
COUPLING AC FAST to AC
SLOPE to +
LEVEL - to see trace
B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 µsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV L PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17.

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED/ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER B BUS

NOTE: If necessary, press RSET pushbutton on DSKY and RESET pushbutton on Programmer and Monitor panel to clear alarm indications that may occur in step 18.

18. Press the following pushbuttons:

CGC/LGC POWER ON
400 CPS POWER ON
(Insure that PROCEED portion of PROCEED/ISS STANDBY is lighted)
PROCEED/ISS STANDBY
OPTICS POWER ON
(Wait for PROCEED portion of PROCEED/ISS OPERATE to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. After 90 seconds have elapsed, repeat steps a and b of Table 1. Record indications.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED/ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER A BUS

24. Repeat steps 18 and 19.

25. After 90 seconds have elapsed, calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV L PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 31.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

33A. Press OPTICS POWER ON pushbutton on the Test Control panel and the OPTICS POWER ON pushbutton shall go out.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV L PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

SIG 2 and measure the voltage on the DVM. Record the indication.

44. Deleted

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 V 800 cps 1%	121
d. OPTICS 28 V 800 cps 1%	101
e. +28 VDC Computer TP	193
f. 28 V 3200 cps Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
*k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

*When recording the CDU +4 volts dc noise measurement ignore spike levels appearing at a rate of 120 cps.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV L PAGE 6 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 3200 cps 1%	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. CGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps 1%	1	008000
b. OPTICS 28 V 800 cps 1%	2	008000
c. 28 V 3200 cps Feedback	5	032000
d. 115 V 400 cps	7	004000

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12208
REV. L
INITIAL TDRR 29882

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______________ SER. NO. ______ ______ CAL DATE

NAME ______________ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______________ NAME/AFFILIATION APPROVED BY ______________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				31.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 V 800 cps, 1%	vac	27.44				28.56		
2.d	OPTICS 28 V 800 cps, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				31.8		
2.f	28 V 3200 cps, Feedback	vac	28.04				29.16		
2.g	-28 VDC **	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.6				14.4		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED

**Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 10

JDC
NO. 12208
REV. L

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	25.9				30.1		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED

** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 10

JDC
NO. 12208
REV. L

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.f	28 V 3200 cps, 1%**	vac	27.7				29.5		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.8				4.2		
3.j	CGC +14 VDC	vdc	13.6				14.4		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.l	IMU Operate +28 VDC**	vdc	25.8				31.8		
3.m	+28 VDC COMPUTER TP	vdc	25.8				31.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTICS 28 V 800 cps	ratio	099875				100125		
7.c	28 V 3200 cps Feedback	ratio	099968				100032		
7.d	115 V 400 cps	ratio	095000				105000		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	μsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 10

JDC
NO. 12208
REV. L

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
20.a	28 VDC (269)	vdc	25.8				31.8		
	Operate/IMU(220)	vdc	27.75				28.25		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				31.8		
27	28V 5% ØA angle	deg	-80				-100		
29	28V 5% ØB angle	deg	▨				▨		
30	Phase angle $\lvert ØA-ØB \rvert$	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-80				-100		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
32	CGC +4 VDC	vdc	3.8				4.2		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 10

JDC
NO. 12208
REV. L

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32	CGC +14 VDC	vdc	13.6				14.4		
(2.i)	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 10

JDC
NO. 12208
REV. L

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
32 (3.g)	+20 VDC (IRIG)	vdc	18.5				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.8				4.2		
32 (3.j)	CGC +14 VDC	vdc	13.6				14.4		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTICS 28 V 800 cps	ratio	099875				100125		
32 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 10

JDC NO. 12208
REV. L

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5% ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle | ØA - ØB |	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.8				4.2		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 8 OF 10

JDC NO. 12208
REV. L

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33	CGC +14 VDC	vdc	13.6				14.4		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 10

JDC NO. 12208
REV. L

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.8		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.8				4.2		
33 (3.j)	CGC +14 VDC	vdc	13.6				14.4		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTICS 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC NO. 12208
REV. L

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC	
				1st	2nd*	3rd*				
33 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC + 4 VDC	vdc	3.8				4.2			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC + 14 VDC	vdc	13.6				14.4			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

DATE 30 JUN 66

JDC 12208 REV. M PAGE 1 OF 7

JOB G & N SYSTEM POWER SUPPLIES TEST
INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30303	6	1,4,6,7,9	EA	WS
B	9-1-66	30924	6	-	JP	-
C	9-15-66	31050	-	1 - 9	EA	-
D	11-10-66	31887	1,4	-	EA	-
E	11-15-66	31941	1,3	1 - 9	EA	-
F	1-26-67	32760	1	3	EA	-
G	6-6-67	33908	3,5,6	All	EA	-
H	7-20-67	34179	5	-	SB	-
J	11-30-67	35184	4	-	EA	-
K	2-29-68	35770	3,4	1,3-10	EA	-
L	3-19-68	35889	2-5	4	EA	-
M	5-26-70	38119	3,5	-	EA	-

REFERENCES

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value. The "MULT BY" factors can be found on the GSE Signal Selection List, part number 2901077.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition in accordance with JDC 12215. Press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV M PAGE 2 OF 7

SUBSYSTEM G & N SYSTEM | ASSY

3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes. Record indications.

4. Set switches and controls on the Counter as follows:

- DISPLAY TIME (N_2) to 10^5
- DISPLAY RESET to ZERO
- CLOCK FREQUENCY DIVIDER to 10
- CLOCK SELECTOR to INT
- INPUT SELECTOR to C SENSE
- SENSE SELECTOR to FWD
- ATTEN to 10 AC
- TRIGGER VOLTAGE fully counterclockwise
- SAMPLE TIME (N_1) to 008000
- FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3. Record indications.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

- TIME/DIV to .1 m sec
- TRIGGER to LOWER BEAM
- COUPLING AC FAST to AC
- SLOPE to +
- LEVEL - to see trace
- B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 µsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

DATE 30 JUN 66

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV M PAGE 3 OF 7

SUBSYSTEM G & N SYSTEM | ASSY

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17.

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

- PROCEED/ISS STANDBY
- OIA ON/ISS POWER DISABLED
- OPTICS POWER ON
- CGC/LGC POWER ON
- 400 CPS POWER ON
- G/N POWER B BUS

NOTE: If necessary, press RSET pushbutton on DSKY and RESET pushbutton on Programmer and Monitor panel to clear alarm indications that may occur in step 18.

18. Press the following pushbuttons:

- CGC/LGC POWER ON
- 400 CPS POWER ON
  - (Insure that PROCEED portion of PROCEED/ISS STANDBY is lighted)
- PROCEED/ISS STANDBY
- OPTICS POWER ON
  - (Wait for PROCEED portion of PROCEED/ISS OPERATE to light)

NOTE: Step 18A applies only if Restart Monitor module (2898989) is installed.

18A. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. After 90 seconds have elapsed, repeat steps a and b of Table 1. Record indications.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

- PROCEED/ISS STANDBY
- OIA ON/ISS POWER DISABLED
- OPTICS POWER ON
- CGC/LGC POWER ON
- 400 CPS POWER ON
- G/N POWER A BUS

24. Repeat steps 18 and 19.

25. After 90 seconds have elapsed, calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

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JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV M PAGE 4 OF 7

SUBSYSTEM G & N SYSTEM | ASSY

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 31.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

33A. Press OPTICS POWER ON pushbutton on the Test Control panel and the OPTICS POWER ON pushbutton shall go out.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

DATE 30 JUN 66

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

44. Deleted

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

NOTE: Step 50 applies only if Restart Monitor module (2898989) is installed.

50. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00077 ENTR

c. The contents of Row 1 shall be 00000.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 V 800 cps 1%	121
d. OPTICS 28 V 800 cps 1%	101
e. +28 VDC Computer TP	193
f. 28 V 3200 cps Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
*k. CDU +4 volts dc	118

*When recording the CDU +4 volts dc noise measurement ignore spike levels appearing at a rate of 120 cps.

Table 1 (cont)

SIGNAL	CROSSBAR CONTROL
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 3200 cps 1%	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. CGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB5-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps 1%	1	008000
b. OPTICS 28 V 800 cps 1%	2	008000
c. 28 V 3200 cps Feedback	5	032000
d. 115 V 400 cps	7	004000

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12208
REV. M
INITIAL TDRR 29882

JOB G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				31.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 V 800 cps, 1%	vac	27.44				28.56		
2.d	OPTICS 28 V 800 cps, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				31.8		
2.f	28 V 3200 cps, Feedback	vac	28.04				29.16		
2.g	-28 VDC **	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.6				14.4		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED

**Correct this measurement using "MULT BY" factor to obtain the true value.

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 **OF** 10

JDC
NO. 12208
REV. M

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.1	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	25.9				30.1		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 **OF** 10

JDC
NO. 12208
REV. M

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.f	28 V 3200 cps, 1%**	vac	27.7				29.5		
3.g	+20 VDC (IRIG)	vdc	18.8				21.2		
3.h	-20 VDC (IRIG)	vdc	-18.0				-22.0		
3.i	CGC +4 VDC	vdc	3.8				4.2		
3.j	CGC +14 VDC	vdc	13.6				14.4		
3.k	Optics Operate +28 VDC	vdc	25.8				30.8		
3.1	IMU Operate +28 VDC**	vdc	25.8				31.8		
3.m	+28 VDC COMPUTER TP	vdc	25.8				31.8		
3.n	+120 VDC PIPA**	vdc	114				126		
3.o	PSAAM PWR #1	vdc	25.8				31.8		
3.p	PSAAM PWR #2	vdc	25.8				31.8		
3.q	PSAAM PWR #3	vdc	25.8				31.8		
7.a	IMU 28 V 800 cps	ratio	099875				100125		
7.b	OPTICS 28 V 800 cps	ratio	099875				100125		
7.c	28 V 3200 cps Feedback	ratio	099968				100032		
7.d	115 V 400 cps	ratio	095000				105000		
9	3200 PPS Sync	v p-p	3				10		
16	Time Difference	µsec	0.0				9.0		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

[illegible]

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 10

JDC
NO. 12208
REV. M

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
20.a	28 VDC (269)	vdc	25.8				31.8		
	Operate/IMU(220)	vdc	27.75				28.25		
20.b	28 VDC OPTICS	vdc	25.8				30.8		
22	28 VDC IMU Operate **	vdc	25.8				31.8		
27	28V 5% øA angle	deg	-80				-100		
29	28V 5% øB angle	deg	▨				▨		
30	Phase angle |øA-øB|	deg	80				100		
31	800 cps 28 V 5% Optics phase angle	deg	-80				-100		
32 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
32 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
32 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
32 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
32	CGC +4 VDC	vdc	3.8				4.2		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 **OF** 10

JDC
NO. 12208
REV. M

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32	CGC +14 VDC	vdc	13.6				14.4		
(2.i)	Noise	v p-p	0				0.4		
32 (2.j)	120 VDC PIP	vdc	114				126		
32 (2.k)	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
32 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
32 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
32 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
32 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
32 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 10

JDC
NO. 12208
REV. M

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
32 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
32 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
32 (3.g)	+20 VDC (IRIG)	vdc	18.5				21.2		
32 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
32 (3.i)	CGC +4 VDC	vdc	3.8				4.2		
32 (3.j)	CGC +14 VDC	vdc	13.6				14.4		
32 (3.n)	+120 VDC PIPA **	vdc	114				126		
32 (7.a)	IMU 28 V 800 cps	ratio	099875				100125		
32 (7.b)	OPTICS 28 V 800 cps	ratio	099875				100125		
32 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 10

JDC
NO. 12208
REV. M

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5% ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle |ØA - ØB|	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	28 V 3200 cps Feedback	vac	28.04				29.16		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.8				4.2		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

FORM 00147
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 8 OF 10

JDC
NO. 12208
REV. M

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33	CGC +14 VDC	vdc	13.6				14.4		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33 (2.n)	X PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.o)	Z PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (2.p)	Y PIPA PVR +28 VDC	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	25.9				30.1		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

FORM 00151
New 9-30-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 10

JDC
NO. 12208
REV. M

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	28 V 3200 cps 1% **	vac	27.7				29.5		
33 (3.g)	+20 VDC (IRIG)	vdc	18.8				21.8		
33 (3.h)	-20 VDC (IRIG)	vdc	-18.0				-22.0		
33 (3.i)	CGC +4 VDC	vdc	3.8				4.2		
33 (3.j)	CGC +14 VDC	vdc	13.6				14.4		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTICS 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC
NO. 12208
REV. M

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC	
				1st	2nd*	3rd*				
33 (7.c)	28 V 3200 cps Feedback	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC +4 VDC	vdc	3.8				4.2			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC + 14 VDC	vdc	13.6				14.4			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

DATE 30 JUN 66

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV. - PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 10

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
							IMPORTANT See Below
							INTERVAL
							TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if JDC 12207 has been completed and system operation has not been interrupted. If system operation has been interrupted, perform JDC 12204, Part A before proceeding with this JDC.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by the "MULT BY" factor to obtain the true value.

NOTE: When making dc measurements in steps 2 and 3, set the PAVM VOLTMETER INPUT switch and the SCOPE "A" INPUT SIGNAL switch on the Primary Signal Selector panel to OFF.

1. Establish a MASTER INITIALIZATION condition.

2. Measure signals listed in column 1 of Table 1 on the DVM by setting the CROSSBAR CONTROL to positions indicated in column 2. In addition, use the oscilloscope to measure the peak-to-peak noise in steps h, i, k, n, o and p. Record indications.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV - PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

3. Using the Buffered and Direct probes on TPA #2, measure the signals listed in column 1 of Table 2 on the DVM by setting the CROSSBAR CONTROL to 199 for ac signals on Buffered probes and to 299 for dc signals on Direct probes.

4. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10 AC
TRIGGER VOLTAGE fully counterclockwise
SAMPLE TIME (N_1) to 008000
FUNCTION to RATIO OR PERIOD

5. Insure the D SIGNAL portion of the D SIGNAL/D PULSE pushbutton on the Primary Signal Selector panel is lighted. Set the COUNTER INPUT "D" SIGNAL selector to 1.

6. Adjust the ATTEN D selector switch on the Counter to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that the Counter starts and stops in about 10 seconds. The Counter should indicate about 100000.

7. Determine frequencies of the signals listed in column 1 of Table 3 by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to positions indicated in column 2. Change SAMPLE TIME (N_1) setting per Table 3.

8. Connect a coaxial cable between connector J1-A and J4-F in the Auxiliary Input Panel. Set the Oscilloscope to trigger "B" TIME BASE.

9. Using the pulse probe, measure and record the peak-to-peak amplitude of 3200 pps at TPA #2 TB1-6 (hi) and TB1-9 (lo) on the Oscilloscope CHANNEL "B".

10. Set the SCOPE B INPUT 2 selector on the Oscillograph Signal Selector panel to 5 and CHANNEL 5 selector to 7. Insure that CH5 AC pushbutton is lighted.

11. Set the DUAL-TRACE AMPLIFIER MODE selector on the Oscilloscope to ALTER. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 10.

12. Pull out TRIGGER CH 1 ONLY switch on the Dual Trace Amplifier.

13. Set the TIME BASE "B" controls as follows:

TIME/DIV to .1 m sec
TRIGGER to LOWER BEAM
COUPLING AC FAST to AC
SLOPE to +
LEVEL - to see trace
B MODE to NORMAL TRIGGER

14. Set switches CH 1 and CH 2 on the Oscilloscope to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

15. Set the TIME BASE "B" TIME/DIV control to 50 μsec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

DATE ______

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV - PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

16. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover to the 28V, 3200 cps signal.

CAUTION: Perform step 18 immediately after step 17

17. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER B BUS

18. Press the following pushbuttons:

CGC/LGC POWER ON
400 CPS POWER ON
(Wait for PROCEED portion to light)
PROCEED/ISS STANDBY
OPTICS POWER ON
(Wait for PROCEED portion to light)

19. Press the PROCEED/ISS OPERATE pushbutton. The ISS OPERATE portion shall light and the PROCEED portion shall go out.

20. Repeat steps a and b of Table 1.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 299.

22. Using the DVM and dc probes, measure and record the 28 VDC IMU Operate voltage at TPA #2 TB1-22 (hi) and TB5-39 (lo).

CAUTION: Perform step 24 immediately after step 23.

23. Remove all power from the G & N system by pressing the pushbuttons on the Test Control panel in the following sequence:

PROCEED ISS STANDBY
OIA ON/ISS POWER DISABLED
OPTICS POWER ON
CGC/LGC POWER ON
400 CPS POWER ON
G/N POWER A BUS

24. Repeat steps 18 and 19.

25. Calibrate the PAVM per steps A.1 through A.21 of JDC 18040 (MEASUREMENT OF A PHASE ANGLE).

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes, monitor the 800 cps 28V 5% Phase A at TPA #2 TB5 pin 37 (hi) and TB5 pin 33 (lo).

27. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using direct probes monitor 800 cps 28V 5% Phase B at TPA #2 TB5 pin 29 (hi) and TB5 pin 33 (lo).

29. Measure and record the phase angle indicated on the PAVM per JDC 18040 steps B.1 through B.7.

30. Calculate the phase angle between steps 27 and 29.

DATE ______

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV - PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

31. Set the CROSSBAR CONTROL to 99 and the VOLTMETER INPUT PAVM switch to SIG 2. Using Direct probes, measure 800 cps 28V 5% Optics phase angle at TPA #2 TB5 pin 35 (hi) and TB5 pin 48 (lo). Record indication.

LOW BUS VOLTAGE

32. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 25.8 (+0.25, -0) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31. In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

HIGH BUS VOLTAGE

33. Set the CROSSBAR CONTROL to 75 and the VOLTMETER INPUT DVM switch to SIG 1. Adjust the G & N POWER ADJUST control for 30.8 (+0, -0.25) volts dc on the DVM. Repeat steps 2 through 16 and 25 through 31.

In step 2 measure only items c, d, f, g, h, i, j, k, m, n, o and p of Table 1, in step 3 measure only items a, b, c, d, e, f, g, h, i, j and n of Table 2 and in step 7 measure only items a, b and c of Table 3.

NORMALIZATION OF SYSTEM

34. Set the CROSSBAR CONTROL to 20 and the VOLTMETER INPUT DVM switch to SIG 2.

35. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 28.0 (±0.25) vdc. Record indication.

CGC +4VDC-CONTROL 1 (ACE)

36. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

37. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

38. Set the INTERFACE LOAD SELECTOR to position 7.

39. Press the TEST START pushbutton. The pushbutton shall light.

40. Set the CROSSBAR CONTROL to 94 and the VOLTMETER INPUT DVM switch to SIG 1 and measure the voltage on the DVM. Record the indication.

41. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

42. Calculate the CGC +4 VDC voltage change.

CGC +14 VDC-CONTROL 2 (ACE)

43. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

44. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

DATE ______

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV - PAGE 5 OF 6
SUBSYSTEM G & N SYSTEM | ASSY

45. Set the INTERFACE LOAD SELECTOR to position 8.

46. Press the TEST START pushbutton. The pushbutton shall light.

47. Set the CROSSBAR CONTROL to 93 and the VOLTMETER INPUT DVM switch to SIG 2 and measure the voltage on the DVM. Record the indication.

48. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

49. Calculate the CGC +14VDC voltage change.

Table 1

SIGNAL	CROSSBAR CONTROL
a. 28 volts dc OPERATE/IMU	269
	220
b. 28 volts dc OPTICS	200
c. IMU 28 volts 1% 800 cps	121
d. OPTICS 28 volts 1% 800 cps	101
e. +28 VDC Computer TP	193
f. 3.2 kcps 28 volts Feedback	123
g. -28 volts dc	124
h. CGC +4 volts dc	194
i. CGC +14.0 volts dc	293
j. 120 VDC PIP	259
k. CDU +4 volts dc	118
l. 115 V 400 cps	177
m. 28 V 800 cps Reference Voltage	119
n. X PIPA PVR +28 vdc	195
o. Z PIPA PVR +28 vdc	196
p. Y PIPA PVR +28 vdc	295

DATE ________

JOB G & N SYSTEM POWER SUPPLIES TEST | JDC 12208 REV - PAGE 6 OF 6
SUBSYSTEM G & N SYSTEM | ASSY

Table 2

SIGNAL	SIGNAL LOCATION
a. IMU 28 volts 1% 800 cps	TB5-24 (hi) and TB5-9 (lo)
b. IMU 28 volts 5% 800 cps PHASE A	TB5-37 (hi) and TB5-33 (lo)
c. IMU 28 volts 5% 800 cps PHASE B	TB5-29 (hi) and TB5-33 (lo)
d. OPTICS 800 cps 1%	TB5-44 (hi) and TB5-48 (lo)
e. OPTICS 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)
f. 28 volts 1% 3200 cps	TB5-20 (hi) and TB5-23 (lo)
g. +20 volts dc monitor (IRIG)	TB2-45 (hi) and TB2-49 (lo)
h. -20 volts dc monitor (IRIG)	TB2-46 (hi) and TB2-49 (lo)
i. CGC +4 volts dc	TB2-27 (hi) and TB2-25 (lo)
j. AGC +14 volts dc	TB2-26 (hi) and TB2-25 (lo)
k. +28 VDC optics	TB5-45 (hi) and TB5-49 (lo)
l. +28 VDC IMU operate	TB1-22 (hi) and TB5-39 (lo)
m. +28 VDC Computer TP	TB2-28 (hi) and TB2-25 (lo)
n. +120 VDC PIPA	TB2-14 (hi) and TB2-17 (lo)
o. PSAAM PWR #1	TB1-26 (hi) and TB5-30 (lo)
p. PSAAM PWR #2	TB1-30 (hi) and TB5-30 (lo)
q. PSAAM PWR #3	TB2-48 (hi) and TB4-30 (lo)

Table 3

SIGNAL	"D" SIGNAL SELECTOR	SAMPLE TIME (N_1)
a. IMU 28 V 800 cps	1	008000
b. OPTX 28 V 800 cps	2	008000
c. 28 V 3.2 KC Feedback	5	032000
d. 400 cps monitor	7	004000

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10
JOB G & N SYSTEM POWER SUPPLIES TEST

JDC
NO. 12208
REV. -
INITIAL TDR 29882

ASSEMBLY UNDER TEST

TITLE ________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTA. ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE
NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	28 VDC (269) OPERATE/IMU	vdc	25.8				30.8		
	(220)	vdc	27.75				28.25		
2.b	28 VDC OPTICS	vdc	25.8				30.8		
2.c	IMU 28 VAC, 1%	vac	27.44				28.56		
2.d	OPTICS 28 VAC, 1%	vac	27.44				28.56		
2.e	+28 VDC Computer TP	vdc	25.8				30.8		
2.f	3.2KC 28 VAC, 1% Feedback	vac	27.44				28.56		
2.g	-28 VDC	vdc	-21.5				-33.5		
2.h	CGC +4 VDC	vdc	3.85				4.15		
	Noise	v p-p	0				0.4		
2.i	CGC +14 VDC	vdc	13.8				14.2		
	Noise	v p-p	0				0.4		
2.j	120 VDC PIP	vdc	114				126		

* TO BE USED AS REQUIRED OR DESIRED
**Correct this measurement using "MULT BY" factor to obtain the true value.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 10
JOB G & N SYSTEM POWER SUPPLIES TEST

JDC
NO. 12208
REV. -

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.k	CDU +4 VDC	vdc	3.8				4.2		
	Noise	v p-p	0.0				0.2		
2.l	115 V 400 cps	vrms	110.7				119.3		
2.m	28 V 800 cps Reference voltage	vrms	26.6				29.4		
2.n	X PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.o	Z PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
2.p	Y PIPA PVR	vdc	26.6				29.4		
	Noise	v p-p	0.0				0.2		
3.a	IMU 28 VAC, 1%**	vac	27.44				28.56		
3.b	IMU 28 VAC, 5% Phase A**	vac	26.6				29.4		
3.c	IMU 28 VAC, 5% Phase B**	vac	26.0				30.0		
3.d	OPTICS 28 VAC, 1%**	vac	27.44				28.56		
3.e	OPTICS 28 VAC, 5%**	vac	26.52				29.48		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 10

JDC
NO. .2208
REV. -

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
32 (9)	3200 PPS Sync	v p-p	3				10		
32 (16)	Time Difference	usec	0.0				9.0		
32 (27)	28 V 5g ØA angle	deg	-100				-80		
32 (29)	28 V 5% ØB angle	deg	▨				▨		
32 (30)	Phase Angle | ØA - ØB |	deg	80				100		
32 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80		
33 (2.c)	IMU 28 VAC 1%	vac	27.44				28.56		
33 (2.d)	OPTICS 28 VAC 1%	vac	27.44				28.56		
33 (2.f)	3.2 KC 28 VAC 1% Feedback	vac	27.44				28.56		
33 (2.g)	-28 VDC **	vdc	-21.5				-33.5		
33	CGC +4 VDC	vdc	3.85				4.15		
(2.h)	Noise	v p-p	0				0.4		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 10

JDC
NO. 12208
REV. -

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33	CGC +14 VDC	vdc	13.8				14.2		
(2.i)	Noise	v p-p	0				0.4		
33 (2.j)	120 VDC PIP	vdc	114				126		
33	CDU +4 VDC	vdc	3.8				4.2		
(2.k)	Noise	v p-p	0.0				0.2		
33 (2.m)	28 V 800 cps Reference voltage	vrms	26.6				29.4		
33	X PIPA PVR	vdc	26.6				29.4		
(2.n)	Noise	v p-p	0.0				0.2		
33	X PIPA PVR	vdc	26.6				29.4		
(2.o)	Noise	v p-p	0.0				0.2		
33	Y PIPA PVR	vdc	26.6				29.4		
(2.p)	Noise	v p-p	0.0				0.2		
33 (3.a)	IMU 28 VAC 1% **	vac	27.44				28.56		
33 (3.b)	IMU 28 VAC 5% Phase A **	vac	26.6				29.4		
33 (3.c)	IMU 28 VAC 5% Phase B **	vac	26.0				30.0		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 10

JDC
NO. 12208
REV. -

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
33 (3.d)	OPTICS 28 VAC 1% **	vac	27.44				28.56		
33 (3.e)	OPTICS 28 VAC 5% **	vac	26.52				29.48		
33 (3.f)	3200 CPS 28 VAC 1% **	vac	27.44				28.56		
33 (3.g)	+20 VDC (IRIG)	vdc	19.8				20.2		
33 (3.h)	-20 VDC (IRIG)	vdc	-19.8				-20.2		
33 (3.i)	CGC +4 VDC	vdc	3.85				4.15		
33 (3.j)	CGC +14 VDC	vdc	13.8				14.2		
33 (3.n)	+120 VDC PIPA **	vdc	114				126		
33 (7.a)	IMU 28 V 800 CPS	ratio	099875				100125		
33 (7.b)	OPTX 28 V 800 CPS	ratio	099875				100125		

* TO BE USED AS REQUIRED OR DESIRED.
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC
NO. 12208
REV. -

JOB G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC	
				1st	2nd*	3rd*				
33 (7.c)	IMU 28 V 3.2 KC	ratio	099968				100032			
33 (9)	3200 PPS Sync	v p-p	3				10			
33 (16)	Time Difference	usec	0.0				9.0			
33 (27)	28 V 5% ØA angle	deg	-100				-80			
33 (29)	28 V 5% ØB angle	deg	▨				▨			
33 (30)	Phase Angle | ØA - ØB |	deg	80				100			
33 (31)	800 cps 28 V 5% Optics phase angle	deg	-100				-80			
35	28 VDC G & N	vdc	27.75				28.25			
36	CGC +4 VDC	vdc	3.85				4.15			(a)
40	Control 1 Voltage	vdc	▨				▨			(b)
42	Line a - line b	vdc	0.4				1.0			
43	CGC +14 VDC	vdc	13.8				14.2			(c)
47	Control 2 Voltage	vdc	▨				▨			(d)
49	Line c - line d	vdc	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED.

DATE ________

JDC 12209 REV. A PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 3

JOB CGC OUTPUT TEST

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30304	1,3	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Insure that the following lamps on the Test Control panel are lighted:
   a. ISS STANDBY
   b. CGC/LGC POWER ON
   c. 400 CPS POWER ON
2. If the STBY lamp on the DSKY is not lighted, proceed to step 4. If the STBY lamp is lighted, perform step 3.
3. Press and hold the STBY pushbutton until the STBY lamp goes out. Perform the following DSKY operations:
   a. Press RSET
   b. VERB 61 ENTR
4. Enter VERB 36 and press the ENTR pushbutton on the NAV DSKY.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to RDC. Set the RDC panel switches as follows:
   a. DE MARGINS to NORM
   b. CH V METERS to DCVM
   c. CHANNEL to 601
   d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbuttons to turn them off.
6. Perform the following DSKY operations:
   a. VERB 57 ENTR
   b. 00011 ENTR
7. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00005

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC OUTPUT TEST
JDC 12209 REV A PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM
ASSY

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	601	+X+P
b.	602	-X-P
c.	603	-X+P
d.	604	+X-P
e.	605	+X+Y
f.	606	-X-Y
g.	607	-X+Y
h.	608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00006
10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.
11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	609	+Z+R
b.	610	-Z-R
c.	611	-Z+R
d.	612	+Z-R
e.	613	+Y+R
f.	614	-Y-R
g.	615	-Y+R
h.	616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 1XXXX
   b. Row 3 displays 00011
13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switch to 506 (ENG ON). Record the DCVM indication.
15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 30000
   b. Row 3 displays 00012
16. Set CHANNEL V switch to 506. Record the DCVM indication.
17. Record the lamp indications on the Monitor panel for each of the following positions:
   a. SIV B INJ SEQ START
   b. SIV B CUT OFF
18. Press the ENTR pushbutton on the DSKY.
19. Record the lamp indications specified in step 17.
20. Record the following DSKY operations:
   a. VERB 21 NOUN 01 ENTR
   b. 01000 ENTR
   c. 77777 ENTR
   d. NOUN 15 ENTR
   e. 77777 ENTR ENTR

DATE 30 JUN 66

JOB CGC OUTPUT TEST
JDC 12209 REV A PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM
ASSY

21. Repeat the following DSKY operations until Row 3 indicates 01060.
   a. 77777 ENTR ENTR
22. Perform the following DSKY operations:
   a. VERB 21 NOUN 01 ENTR
   b. 00413 ENTR
   c. 01000 ENTR
23. Press the DL ENABLE and WORD RATE 50 PPS pushbuttons.
24. Set switches as follows:
   XY Interface panel
      a. CHANNEL T to 102 (DLNK DATA)
      b. SCOPE to T
   Oscilloscope panel
      c. A to NORMAL DC
      d. B to INVERTED DC
      e. MODE to A + B

Insure the VOLT/DIV switches on Channel A and B are set to the same position. Measure and record the oscilloscope indication.

25. Set the SCOPE switch to S→T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.
26. Press the WORD RATE 10 PPS and the WORD RATE 50 PPS pushbuttons, adjust the scope and repeat step 25.
27. Press the WORD RATE 300 PPS and the WORD RATE 10 PPS pushbuttons. When the KEY REL light flashes, press the KEY REL pushbutton on the DSKY. VERB 05 and NOUN 31 shall be displayed on the DSKYs and Row 1 shall indicate 01105. The PROG lamp on the DSKYs shall be lighted.
28. Perform the following DSKY operations:
   a. VERB 11 NOUN 10 ENTR
   b. 00033 ENTR

Row 1 shall indicate X2XXX.

29. Press the DL ENABLE and WORD RATE 300 PPS pushbuttons and set the CHANNEL S and T switches to 101.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12209
REV. A
INITIAL TDRR 29882

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION
APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	2.0		5.0		
b	RCS JET -X-P	vdc	2.0		5.0		
c	RCS JET -X+P	vdc	2.0		5.0		
d	RCS JET +X-P	vdc	2.0		5.0		
e	RCS JET +X+Y	vdc	2.0		5.0		
f	RCS JET -X-Y	vdc	2.0		5.0		
g	RCS JET -X+Y	vdc	2.0		5.0		
h	RCS JET +X-Y	vdc	2.0		5.0		
10.a	RCS JET +X+P	vdc	9.0		11.0		
b	RCS JET -X-P	vdc	9.0		11.0		
c	RCS JET -X+P	vdc	9.0		11.0		
d	RCS JET +X-P	vdc	9.0		11.0		
e	RCS JET +X+Y	vdc	9.0		11.0		
f	RCS JET -X-Y	vdc	9.0		11.0		
g	RCS JET -X+Y	vdc	9.0		11.0		
h	RCS JET +X-Y	vdc	9.0		11.0		
11.a	RCS JET +Z+R	vdc	2.0		5.0		
b	RCS JET -Z-R	vdc	2.0		5.0		
c	RCS JET -Z+R	vdc	2.0		5.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12209
REV. A

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	2.0		5.0		
e	RCS JET +Y+R	vdc	2.0		5.0		
f	RCS JET -Y-R	vdc	2.0		5.0		
g	RCS JET -Y+R	vdc	2.0		5.0		
h	RCS JET +Y-R	vdc	2.0		5.0		
13.a	RCS JET +Z+R	vdc	9.0		11.0		
b	RCS JET -Z-R	vdc	9.0		11.0		
c	RCS JET -Z+R	vdc	9.0		11.0		
d	RCS JET +Z-R	vdc	9.0		11.0		
e	RCS JET +Y+R	vdc	9.0		11.0		
f	RCS JET -Y-R	vdc	9.0		11.0		
g	RCS JET -Y+R	vdc	9.0		11.0		
h	RCS JET +Y-R	vdc	9.0		11.0		
14	ENG ON	vdc	2.0		5.0		
16	ENG ON	vdc	9.0		11.0		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude	volts	5.0		9.0		
	Pulse Width	usec	2.0		6.0		
	Droop	volts	▨		+A/5		
	Rise Time	usec	▨		0.2		
	Noise	volts	-6.0		+0.4		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12209
REV. A

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 pps)	usec	▨		1.0		
	DSKY Displays (Reacted as specified)						
	REMARKS:						

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 REV. B PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30304	1,3	-	EA	-
B	9-1-66	30929	2	-	JP	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Insure that the following lamps on the Test Control panel are lighted:

a. ISS STANDBY

b. CGC/ LGC POWER ON

c. 400 CPS POWER ON

2. If the STBY lamp on the DSKY is not lighted, proceed to step 4. If the STBY lamp is lighted, perform step 3.

3. Press and hold the STBY pushbutton until the STBY lamp goes out. Perform the following DSKY operations:

a. Press RSET

b. VERB 61 ENTR

4. Enter VERB 36 and press the ENTR pushbutton on the NAV DSKY.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to RDC. Set the RDC panel switches as follows:

a. DE MARGINS to NORM

b. CH V METERS to DCVM

c. CHANNEL to 601

d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbutton to turn them off.

6. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00011 ENTR

7. Observe that the DSKY displays the following:

a. Row 1 displays XX377

b. Row 3 displays 00005

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 REV B PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	601	+X+P
b.	602	-X-P
c.	603	-X+P
d.	604	+X-P
e.	605	+X+Y
f.	606	-X-Y
g.	607	-X+Y
h.	608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:

a. Row I displays XX377

b. Row 3 displays 00006

10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.

11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	609	+Z+R
b.	610	-Z-R
c.	611	-Z+R
d.	612	+Z-R
e.	613	+Y+R
f.	614	-Y-R
g.	615	-Y+R
h.	616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:

a. Row 1 displays 1XXXX

b. Row 3 displays 00011

13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switch to 506 (ENG ON). Record the DCVM indication.

15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:

a. Row 1 displays 30000

b. Row 3 displays 00012

16. Set CHANNEL V switch to 506. Record the DCVM indication.

17. Record the lamp indications on the Monitor panel for each of the following positions:

a. SIV B INJ SEQ START

b. SIV B CUT OFF

18. Press the ENTR pushbutton on the DSKY.

19. Record the lamp indications specified in step 17.

20. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 01000 ENTR

c. 77777 ENTR

d. NOUN 15 ENTR

e. 77777 ENTR ENTR

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 REV B PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

21. Repeat the following DSKY operations until Row 3 indicates 01060.

a. 77777 ENTR ENTR

22. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 00413 ENTR

c. 01000 ENTR

23. Press the DL ENABLE and WORD RATE 50 PPS pushbuttons.

24. Set switches as follows:

XY Interface panel

a. CHANNEL T to 102 (DLNK DATA)

b. SCOPE to T

Oscilloscope panel

c. A to NORMAL DC

d. B to INVERTED DC

e. MODE to A + B

Insure the VOLT/DIV switches on Channel A and B are set to the same position. Measure and record the oscilloscope indication.

25. Set the SCOPE switch to S→T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.

26. Press the WORD RATE 10 PPS and the WORD RATE 50 PPS pushbuttons, adjust the scope and repeat step 25.

27. Press the WORD RATE 300 PPS and the WORD RATE 10 PPS pushbuttons. When the KEY REL light flashes, press the KEY REL pushbutton on the DSKY. VERB 05 and NOUN 31 shall be displayed on the DSKYs and Row 1 shall indicate 01105. The PROG lamp on the DSKYs shall be lighted.

28. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00033 ENTR

Row 1 shall indicate X2XXX.

29. Press the DL ENABLE and WORD RATE 300 PPS pushbuttons and set the CHANNEL S and T switches to 101.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12209
REV. B
INITIAL TDRR 29882

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST

TITLE

SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	2.0		5.0		
b	RCS JET -X-P	vdc	2.0		5.0		
c	RCS JET -X+P	vdc	2.0		5.0		
d	RCS JET +X-P	vdc	2.0		5.0		
e	RCS JET +X+Y	vdc	2.0		5.0		
f	RCS JET -X-Y	vdc	2.0		5.0		
g	RCS JET -X+Y	vdc	2.0		5.0		
h	RCS JET +X-Y	vdc	2.0		5.0		
10.a	RCS JET +X+P	vdc	9.0		11.0		
b	RCS JET -X-P	vdc	9.0		11.0		
c	RCS JET -X+P	vdc	9.0		11.0		
d	RCS JET +X-P	vdc	9.0		11.0		
e	RCS JET +X+Y	vdc	9.0		11.0		
f	RCS JET -X-Y	vdc	9.0		11.0		
g	RCS JET -X+Y	vdc	9.0		11.0		
h	RCS JET +X-Y	vdc	9.0		11.0		
11.a	RCS JET +Z+R	vdc	2.0		5.0		
b	RCS JET -Z-R	vdc	2.0		5.0		
c	RCS JET -Z+R	vdc	2.0		5.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12209
REV. B

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	2.0		5.0		
e	RCS JET +Y+R	vdc	2.0		5.0		
f	RCS JET -Y-R	vdc	2.0		5.0		
g	RCS JET -Y+R	vdc	2.0		5.0		
h	RCS JET +Y-R	vdc	2.0		5.0		
13.a	RCS JET +Z+R	vdc	9.0		11.0		
b	RCS JET -Z-R	vdc	9.0		11.0		
c	RCS JET -Z+R	vdc	9.0		11.0		
d	RCS JET +Z-R	vdc	9.0		11.0		
e	RCS JET +Y+R	vdc	9.0		11.0		
f	RCS JET -Y-R	vdc	9.0		11.0		
g	RCS JET -Y+R	vdc	9.0		11.0		
h	RCS JET +Y-R	vdc	9.0		11.0		
14	ENG ON	vdc	2.0		5.0		
16	ENG ON	vdc	9.0		11.0		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude	volts	5.0		9.0		
	Pulse Width	usec	2.0		6.0		
	Droop	volts	▨		+A/5		
	Rise Time	usec	▨		0.2		
	Noise	volts	-6.0		+0.4		

DATE 30 JUN 36

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12209
REV. B

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 pps)	usec	▨		1.0		
	DSKY Displays (Reacted as specified)						
	REMARKS:						

DATE 30 JUN 66

JOB CGC OUTPUT TEST | JDC 12209 REV. C PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30304	1,3	-	EA	-
B	9-1-66	30929	2	-	JP	-
C	11-10-66	31888	All	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Insure that the following lamps on the Test Control panel are lighted:
   a. ISS STANDBY
   b. CGC/ LGC POWER ON
   c. 400 CPS POWER ON

2. If the STBY lamp on the DSKY is not lighted, proceed to step 4. If the STBY lamp is lighted, perform step 3.

3. Press and hold the STBY pushbutton until the STBY lamp goes out. Perform the following DSKY operations:

a.	Press	RSET
b.	VERB 61	ENTR

4. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to CTS RDC. Set the RDC Interface panel switches as follows:
   a. DE MARGINS to NORM
   b. CH V METERS to DCVM
   c. CHANNEL V to 601
   d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbutton to turn them off.

6. Perform the following DSKY operations:

a.	VERB 57	ENTR
b.	00011	ENTR

7. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00005

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC OUTPUT TEST | JDC 12209 REV C PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	601	+X+P
b.	602	-X-P
c.	603	-X+P
d.	604	+X-P
e.	605	+X+Y
f.	606	-X-Y
g.	607	-X+Y
h.	608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00006

10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.

11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	609	+Z+R
b.	610	-Z-R
c.	611	-Z+R
d.	612	+Z-R
e.	613	+Y+R
f.	614	-Y-R
g.	615	-Y+R
h.	616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 1XXXX
   b. Row 3 displays 00011

13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switches to 506 (ENG ON). Record the DCVM indication.

15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 30000
   b. Row 3 displays 00012

16. Set CHANNEL V switches to 506. Record the DCVM indication.

17. Record that following Monitor panel indicators are lighted:
   a. SIV B INJ SEQ START
   b. SIV B CUT OFF

18. Press the ENTR pushbutton on the DSKY.

19. Record that following Monitor panel indicators are not lighted:
   a. SIV B INJ SEQ START
   b. SIV B CUT OFF

20. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	01000		ENTR
c.	77777		ENTR
d.	NOUN 15		ENTR
e.	77777		ENTR ENTR

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JOB CGC OUTPUT TEST | JDC 12209 REV C PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

21. Repeat the following DSKY operations until Row 3 indicates 01060.

a.	77777	ENTR ENTR

22. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	00413		ENTR
c.	01000		ENTR

23. Press the DL ENABLE and WORD RATE 50 PPS pushbuttons on XY Interface panel.

24. Set switches as follows:
   XY Interface panel
   a. CHANNEL T to 102 (DLNK DATA)
   b. SCOPE to T
   Oscilloscope panel
   c. A to NORMAL DC
   d. B to INVERTED DC
   e. MODE to A + B

Insure the VOLT/DIV switches on Channel A and B are set to the same position. Measure and record the oscilloscope indication.

25. Set the SCOPE switch to S→T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.

26. Press the WORD RATE 10 PPS and the WORD RATE 50 PPS pushbuttons, adjust the scope and repeat step 25.

27. Press the WORD RATE 300 PPS and the WORD RATE 10 PPS pushbuttons. When the KEY REL light flashes, press the KEY REL pushbutton on the DSKY. VERB 05 and NOUN 31 shall be displayed on the DSKY and Row 1 shall indicate 01105. The PROG lamp on the DSKY shall be lighted.

28. Perform the following DSKY operations:

a.	VERB 11	NOUN 10	ENTR
b.	00033		ENTR

Row 1 shall indicate X2XXX.

29. Press the DL ENABLE and WORD RATE 300 PPS pushbuttons and set the CHANNEL S and T switches to 101.

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EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12209
REV. C
INITIAL TDRR 29882

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	2.0		5.0		
b	RCS JET -X-P	vdc	2.0		5.0		
c	RCS JET -X+P	vdc	2.0		5.0		
d	RCS JET +X-P	vdc	2.0		5.0		
e	RCS JET +X+Y	vdc	2.0		5.0		
f	RCS JET -X-Y	vdc	2.0		5.0		
g	RCS JET -X+Y	vdc	2.0		5.0		
h	RCS JET +X-Y	vdc	2.0		5.0		
10.a	RCS JET +X+P	vdc	9.0		11.0		
b	RCS JET -X-P	vdc	9.0		11.0		
c	RCS JET -X+P	vdc	9.0		11.0		
d	RCS JET +X-P	vdc	9.0		11.0		
e	RCS JET +X+Y	vdc	9.0		11.0		
f	RCS JET -X-Y	vdc	9.0		11.0		
g	RCS JET -X+Y	vdc	9.0		11.0		
h	RCS JET +X-Y	vdc	9.0		11.0		
11.a	RCS JET +Z+R	vdc	2.0		5.0		
b	RCS JET -Z-R	vdc	2.0		5.0		
c	RCS JET -Z+R	vdc	2.0		5.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12209
REV. C

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	2.0		5.0		
e	RCS JET +Y+R	vdc	2.0		5.0		
f	RCS JET -Y-R	vdc	2.0		5.0		
g	RCS JET -Y+R	vdc	2.0		5.0		
h	RCS JET +Y-R	vdc	2.0		5.0		
13.a	RCS JET +Z+R	vdc	9.0		11.0		
b	RCS JET -Z-R	vdc	9.0		11.0		
c	RCS JET -Z+R	vdc	9.0		11.0		
d	RCS JET +Z-R	vdc	9.0		11.0		
e	RCS JET +Y+R	vdc	9.0		11.0		
f	RCS JET -Y-R	vdc	9.0		11.0		
g	RCS JET -Y+R	vdc	9.0		11.0		
h	RCS JET +Y-R	vdc	9.0		11.0		
14	ENG ON	vdc	2.0		5.0		
16	ENG ON	vdc	9.0		11.0		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude	volts	5.0		9.0		
	Pulse Width	usec	2.0		6.0		
	Droop	volts	▨		+A/5		
	Rise Time	usec	▨		0.2		
	Noise	volts	-6.0		+0.4		

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EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12209
REV. C

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 pps)	usec	▨		1.0		
	DSKY Displays (Reacted as specified)						
	REMARKS:						

DATE 30 JUN 66

JOB CGC OUTPUT TEST	**JDC** 12209 **REV.** D **PAGE** 1 **OF** 3 **INITIAL TDRR** 29882 **D.S. PGS** 3
SUBSYSTEM G & N SYSTEM	**ASSY.**

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		
			JDC	D.S.	MIT	NASA	REFERENCES PS-2015000
A	7-28-66	30304	1,3	-	EA	-	
B	9-1-66	30929	2	-	JP	-	
C	11-10-66	31888	All	-	EA	-	IMPORTANT
D	3-9-67	33187	2	-	EA	-	
							INTERVAL
							TOOLS AND MATERIAL

1. Insure that the following lamps on the Test Control panel are lighted:
   a. ISS STANDBY
   b. CGC/LGC POWER ON
   c. 400 CPS POWER ON
2. If the STBY lamp on the DSKY is not lighted, proceed to step 4. If the STBY lamp is lighted, perform step 3.
3. Press and hold the STBY pushbutton until the STBY lamp goes out. Perform the following DSKY operations:
   a. Press RSET
   b. VERB 61 ENTR
4. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to CTS RDC. Set the RDC Interface panel switches as follows:
   a. DE MARGINS to NORM
   b. CH V METERS to DCVM
   c. CHANNEL V to 601
   d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbutton to turn them off.
6. Perform the following DSKY operations:
   a. VERB 57 ENTR
   b. 00011 ENTR
7. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00005

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB CGC OUTPUT TEST	**JDC** 12209 **REV** D **PAGE** 2 **OF** 3
SUBSYSTEM G & N SYSTEM	**ASSY**

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	601	+X+P
b.	602	-X-P
c.	603	-X+P
d.	604	+X-P
e.	605	+X+Y
f.	606	-X-Y
g.	607	-X+Y
h.	608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00006
10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.
11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	609	+Z+R
b.	610	-Z-R
c.	611	-Z+R
d.	612	+Z-R
e.	613	+Y+R
f.	614	-Y-R
g.	615	-Y+R
h.	616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 1XXXX
   b. Row 3 displays 00011
13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switches to 506 (ENG ON). Record the DCVM indication.
15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 30000
   b. Row 3 displays 00012
16. Set CHANNEL V switches to 506. Record the DCVM indication.

NOTE: Indications of step 17 and step 19 occur only with MAIN DSKY installed or with cable W-160 (P3) connected to the DSKY.

17. Record that following Monitor panel indicators are lighted:
   a. SIV B INJ SEQ START
   b. SIV B CUT OFF
18. Press the ENTR pushbutton on the DSKY.
19. Record that following Monitor panel indicators are not lighted:
   a. SIV B INJ SEQ START
   b. SIV B CUT OFF

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JOB CGC OUTPUT TEST	**JDC** 12209 **REV** D **PAGE** 3 **OF** 3
SUBSYSTEM G & N SYSTEM	**ASSY**

20. Perform the following DSKY operations:
   a. VERB 21 NOUN 01 ENTR
   b. 01000 ENTR
   c. 77777 ENTR
   d. NOUN 15 ENTR
   e. 77777 ENTR ENTR
21. Repeat the following DSKY operations until Row 3 indicates 01060.
   a. 77777 ENTR ENTR
22. Perform the following DSKY operations:
   a. VERB 21 NOUN 01 ENTR
   b. 00413 ENTR
   c. 01000 ENTR
23. Press the DL ENABLE and WORD RATE 50 PPS pushbuttons on XY Interface panel.
24. Set switches as follows:
   XY Interface panel
   a. CHANNEL T to 102 (DLNK DATA)
   b. SCOPE to T
   Oscilloscope panel
   c. A to NORMAL DC
   d. B to INVERTED DC
   e. MODE to A + B

Insure the VOLT/DIV switches on Channel A and B are set to the same position. Measure and record the oscilloscope indication.

25. Set the SCOPE switch to S→T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.
26. Press the WORD RATE 10 PPS and the WORD RATE 50 PPS pushbuttons, adjust the scope and repeat step 25.
27. Press the WORD RATE 300 PPS and the WORD RATE 10 PPS pushbuttons. When the KEY REL light flashes, press the KEY REL pushbutton on the DSKY.

VERB 05 and NOUN 31 shall be displayed on the DSKY and Row 1 shall indicate 01105. The PROG lamp on the DSKY shall be lighted.

28. Perform the following DSKY operations:
   a. VERB 11 NOUN 10 ENTR
   b. 00033 ENTR

Row 1 shall indicate X2XXX.

29. Press the DL ENABLE and WORD RATE 300 PPS pushbuttons and set the CHANNEL S and T switches to 101.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 3

JDC NO. 12209
REV. D
INITIAL TDRR 29882

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST	**TEST HISTORY**
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	2.0		5.0		
b	RCS JET -X-P	vdc	2.0		5.0		
c	RCS JET -X+P	vdc	2.0		5.0		
d	RCS JET +X-P	vdc	2.0		5.0		
e	RCS JET +X+Y	vdc	2.0		5.0		
f	RCS JET -X-Y	vdc	2.0		5.0		
g	RCS JET -X+Y	vdc	2.0		5.0		
h	RCS JET +X-Y	vdc	2.0		5.0		
10.a	RCS JET +X+P	vdc	9.0		11.0		
b	RCS JET -X-P	vdc	9.0		11.0		
c	RCS JET -X+P	vdc	9.0		11.0		
d	RCS JET +X-P	vdc	9.0		11.0		
e	RCS JET +X+Y	vdc	9.0		11.0		
f	RCS JET -X-Y	vdc	9.0		11.0		
g	RCS JET -X+Y	vdc	9.0		11.0		
h	RCS JET +X-Y	vdc	9.0		11.0		
11.a	RCS JET +Z+R	vdc	2.0		5.0		
b	RCS JET -Z-R	vdc	2.0		5.0		
c	RCS JET -Z+R	vdc	2.0		5.0		

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EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12209
REV. D

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	2.0		5.0		
e	RCS JET +Y+R	vdc	2.0		5.0		
f	RCS JET -Y-R	vdc	2.0		5.0		
g	RCS JET -Y+R	vdc	2.0		5.0		
h	RCS JET +Y-R	vdc	2.0		5.0		
13.a	RCS JET +Z+R	vdc	9.0		11.0		
b	RCS JET -Z-R	vdc	9.0		11.0		
c	RCS JET -Z+R	vdc	9.0		11.0		
d	RCS JET +Z-R	vdc	9.0		11.0		
e	RCS JET +Y+R	vdc	9.0		11.0		
f	RCS JET -Y-R	vdc	9.0		11.0		
g	RCS JET -Y+R	vdc	9.0		11.0		
h	RCS JET +Y-R	vdc	9.0		11.0		
14	ENG ON	vdc	2.0		5.0		
16	ENG ON	vdc	9.0		11.0		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude	volts	5.0		9.0		
	Pulse Width	usec	2.0		6.0		
	Droop	volts	▨		+A/5		
	Rise Time	usec	▨		0.2		
	Noise	volts	-6.0		+0.4		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12209
REV. D

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 pps)	usec	▨		1.0		
	DSKY Displays (Reacted as specified)						
	REMARKS:						

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 REV. E PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS. 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30304	1,3	-	EA	-
B	9-1-66	30929	2	-	JP	-
C	11-10-66	31888	All	-	EA	-
D	3-9-67	33187	2	-	EA	-
E	5-4-67	33718	-	2	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Insure that the following lamps on the Test Control panel are lighted:
   - a. ISS STANDBY
   - b. CGC/ LGC POWER ON
   - c. 400 CPS POWER ON

2. If the STBY lamp on the DSKY is not lighted, proceed to step 4. If the STBY lamp is lighted, perform step 3.

3. Press and hold the STBY pushbutton until the STBY lamp goes out. Perform the following DSKY operations:

a.	Press	RSET
b.	VERB 61	ENTR

4. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to CTS RDC. Set the RDC Interface panel switches as follows:
   - a. DE MARGINS to NORM
   - b. CH V METERS to DCVM
   - c. CHANNEL V to 601
   - d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbutton to turn them off.

6. Perform the following DSKY operations:

a.	VERB 57	ENTR
b.	00011	ENTR

7. Observe that the DSKY displays the following:
   - a. Row 1 displays XX377
   - b. Row 3 displays 00005

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 REV E PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	601	+X+P
b.	602	-X-P
c.	603	-X+P
d.	604	+X-P
e.	605	+X+Y
f.	606	-X-Y
g.	607	-X+Y
h.	608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   - a. Row 1 displays XX377
   - b. Row 3 displays 00006

10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.

11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	609	+Z+R
b.	610	-Z-R
c.	611	-Z+R
d.	612	+Z-R
e.	613	+Y+R
f.	614	-Y-R
g.	615	-Y+R
h.	616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   - a. Row 1 displays 1XXXX
   - b. Row 3 displays 00011

13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switches to 506 (ENG ON). Record the DCVM indication.

15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   - a. Row 1 displays 30000
   - b. Row 3 displays 00012

16. Set CHANNEL V switches to 506. Record the DCVM indication.

NOTE: Indications of step 17 and step 19 occur only with MAIN DSKY installed or with cable W-160 (P3) connected to the DSKY.

17. Record that following Monitor panel indicators are lighted:
   - a. SIV B INJ SEQ START
   - b. SIV B CUT OFF

18. Press the ENTR pushbutton on the DSKY.

19. Record that following Monitor panel indicators are not lighted:
   - a. SIV B INJ SEQ START
   - b. SIV B CUT OFF

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JOB CGC OUTPUT TEST

JDC 12209 REV E PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

20. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	01000		ENTR
c.	77777		ENTR
d.	NOUN 15		ENTR
e.	77777		ENTR ENTR

21. Repeat the following DSKY operations until Row 3 indicates 01060.

a.	77777	ENTR ENTR

22. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	00413		ENTR
c.	01000		ENTR

23. Press the DL ENABLE and WORD RATE 50 PPS pushbuttons on XY Interface panel.

24. Set switches as follows:

XY Interface panel
   - a. CHANNEL T to 102 (DLNK DATA)
   - b. SCOPE to T

Oscilloscope panel
   - c. A to NORMAL DC
   - d. B to INVERTED DC
   - e. MODE to A + B

Insure the VOLT/DIV switches on Channel A and B are set to the same position. Measure and record the oscilloscope indication.

25. Set the SCOPE switch to S→T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.

26. Press the WORD RATE 10 PPS and the WORD RATE 50 PPS pushbuttons, adjust the scope and repeat step 25.

27. Press the WORD RATE 300 PPS and the WORD RATE 10 PPS pushbuttons. When the KEY REL light flashes, press the KEY REL pushbutton on the DSKY. VERB 05 and NOUN 31 shall be displayed on the DSKY and Row 1 shall indicate 01105. The PROG lamp on the DSKY shall be lighted.

28. Perform the following DSKY operations:

a.	VERB 11	NOUN 10	ENTR
b.	00033	ENTR	

Row 1 shall indicate X2XXX.

29. Press the DL ENABLE and WORD RATE 300 PPS pushbuttons and set the CHANNEL S and T switches to 101.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12209
REV. E
INITIAL TDRR 29882

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	2.0		5.0		
b	RCS JET -X-P	vdc	2.0		5.0		
c	RCS JET -X+P	vdc	2.0		5.0		
d	RCS JET +X-P	vdc	2.0		5.0		
e	RCS JET +X+Y	vdc	2.0		5.0		
f	RCS JET -X-Y	vdc	2.0		5.0		
g	RCS JET -X+Y	vdc	2.0		5.0		
h	RCS JET +X-Y	vdc	2.0		5.0		
10.a	RCS JET +X+P	vdc	9.0		11.0		
b	RCS JET -X-P	vdc	9.0		11.0		
c	RCS JET -X+P	vdc	9.0		11.0		
d	RCS JET +X-P	vdc	9.0		11.0		
e	RCS JET +X+Y	vdc	9.0		11.0		
f	RCS JET -X-Y	vdc	9.0		11.0		
g	RCS JET -X+Y	vdc	9.0		11.0		
h	RCS JET +X-Y	vdc	9.0		11.0		
11.a	RCS JET +Z+R	vdc	2.0		5.0		
b	RCS JET -Z-R	vdc	2.0		5.0		
c	RCS JET -Z+R	vdc	2.0		5.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12209
REV. E

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	2.0		5.0		
e	RCS JET +Y+R	vdc	2.0		5.0		
f	RCS JET -Y-R	vdc	2.0		5.0		
g	RCS JET -Y+R	vdc	2.0		5.0		
h	RCS JET +Y-R	vdc	2.0		5.0		
13.a	RCS JET +Z+R	vdc	9.0		11.0		
b	RCS JET -Z-R	vdc	9.0		11.0		
c	RCS JET -Z+R	vdc	9.0		11.0		
d	RCS JET +Z-R	vdc	9.0		11.0		
e	RCS JET +Y+R	vdc	9.0		11.0		
f	RCS JET -Y-R	vdc	9.0		11.0		
g	RCS JET -Y+R	vdc	9.0		11.0		
h	RCS JET +Y-R	vdc	9.0		11.0		
14	ENG ON	vdc	2.0		5.0		
16	ENG ON	vdc	9.0		11.0		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude	volts	5.0		9.0		
	Pulse Width	usec	2.0		6.0		
	Droop	volts	▨		+A/5		
	Rise Time	usec	▨		0.2		
	Noise	volts	-4.0		+0.4		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12209
REV. E

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 pps)	usec	▨		1.0		
	DSKY Displays (Reacted as specified)						
	REMARKS:						

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 REV. F PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	7-28-66	30304	1,3	-	EA	-
B	9-1-66	30929	2	-	JP	-
C	11-10-66	31888	All	-	EA	-
D	3-9-67	33187	2	-	EA	-
E	5-4-67	33718	-	2	EA	-
F	6-1-67	33884	3	2	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Insure that the following lamps on the Test Control panel are lighted:
   a. ISS STANDBY
   b. CGC/LGC POWER ON
   c. 400 CPS POWER ON

2. If the STBY lamp on the DSKY is not lighted, proceed to step 4. If the STBY lamp is lighted, perform step 3.

3. Press and hold the STBY pushbutton until the STBY lamp goes out. Perform the following DSKY operations:

a.	Press	RSET
b.	VERB 61	ENTR

4. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to CTS RDC. Set the RDC Interface panel switches as follows:
   a. DE MARGINS to NORM
   b. CH V METERS to DCVM
   c. CHANNEL V to 601
   d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbutton to turn them off.

6. Perform the following DSKY operations:

a.	VERB 57	ENTR
b.	00011	ENTR

7. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00005

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 REV F PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	601	+X+P
b.	602	-X-P
c.	603	-X+P
d.	604	+X-P
e.	605	+X+Y
f.	606	-X-Y
g.	607	-X+Y
h.	608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00006

10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.

11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	609	+Z+R
b.	610	-Z-R
c.	611	-Z+R
d.	612	+Z-R
e.	613	+Y+R
f.	614	-Y-R
g.	615	-Y+R
h.	616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 1XXXX
   b. Row 3 displays 00011

13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switches to 506 (ENG ON). Record the DCVM indication.

15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 30000
   b. Row 3 displays 00012

16. Set CHANNEL V switches to 506. Record the DCVM indication.

NOTE: Indications of step 17 and step 19 occur only with MAIN DSKY installed or with cable W-160 (P3) connected to the DSKY.

17. Record that following Monitor panel indicators are lighted:
   a. SIV B INJ SEQ START
   b. SIV B CUT OFF

18. Press the ENTR pushbutton on the DSKY.

19. Record that following Monitor panel indicators are not lighted:
   a. SIV B INJ SEQ START
   b. SIV B CUT OFF

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JOB CGC OUTPUT TEST

JDC 12209 REV F PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

20. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	01000		ENTR
c.	77777		ENTR
d.	NOUN 15		ENTR
e.	77777		ENTR ENTR

21. Repeat the following DSKY operations until Row 3 indicates 01060.

a.	77777	ENTR ENTR

22. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	00413		ENTR
c.	01000		ENTR

23. Press the DL ENABLE and WORD RATE 50 PPS pushbuttons on XY Interface panel.

24. Set switches as follows:

XY Interface panel
   a. CHANNEL T to 102 (DLNK DATA)
   b. SCOPE to T

Oscilloscope panel
   c. A to NORMAL DC
   d. B to INVERTED DC
   e. MODE to A + B

Insure the VOLT/DIV switches on Channel A and B are set to the same position. Measure and record the oscilloscope indication. (See figure 1.)

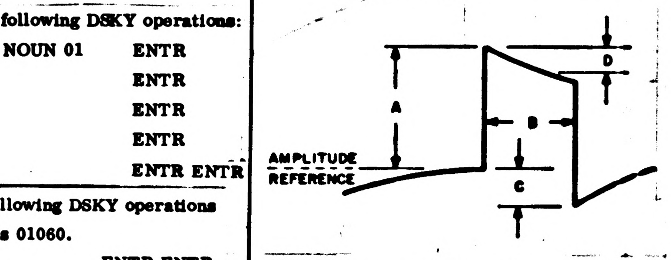

Figure 1. Pulse Diagram

25. Set the SCOPE switch to S→T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.

26. Press the WORD RATE 10 PPS and the WORD RATE 50 PPS pushbuttons, adjust the scope and repeat step 25.

27. Press the WORD RATE 300 PPS and the WORD RATE 10 PPS pushbuttons. When the KEY REL light flashes, press the KEY REL pushbutton on the DSKY. VERB 05 and NOUN 31 shall be displayed on the DSKY and Row 1 shall indicate 01105. The PROG lamp on the DSKY shall be lighted.

28. Perform the following DSKY operations:

a.	VERB 11	NOUN 10	ENTR
b.	00033	ENTR	

Row 1 shall indicate X2XXX.

29. Press the DL ENABLE and WORD RATE 300 PPS pushbuttons and set the CHANNEL S and T switches to 101.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12209
REV. F
INITIAL TDRR 29882

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST

TITLE

SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	2.0		5.0		
b	RCS JET -X-P	vdc	2.0		5.0		
c	RCS JET -X+P	vdc	2.0		5.0		
d	RCS JET +X-P	vdc	2.0		5.0		
e	RCS JET +X+Y	vdc	2.0		5.0		
f	RCS JET -X-Y	vdc	2.0		5.0		
g	RCS JET -X+Y	vdc	2.0		5.0		
h	RCS JET +X-Y	vdc	2.0		5.0		
10.a	RCS JET +X+P	vdc	9.0		11.0		
b	RCS JET -X-P	vdc	9.0		11.0		
c	RCS JET -X+P	vdc	9.0		11.0		
d	RCS JET +X-P	vdc	9.0		11.0		
e	RCS JET +X+Y	vdc	9.0		11.0		
f	RCS JET -X-Y	vdc	9.0		11.0		
g	RCS JET -X+Y	vdc	9.0		11.0		
h	RCS JET +X-Y	vdc	9.0		11.0		
11.a	RCS JET +Z+R	vdc	2.0		5.0		
b	RCS JET -Z-R	vdc	2.0		5.0		
c	RCS JET -Z+R	vdc	2.0		5.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12209
REV. F

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	2.0		5.0		
e	RCS JET +Y+R	vdc	2.0		5.0		
f	RCS JET -Y-R	vdc	2.0		5.0		
g	RCS JET -Y+R	vdc	2.0		5.0		
h	RCS JET +Y-R	vdc	2.0		5.0		
13.a	RCS JET +Z+R	vdc	9.0		11.0		
b	RCS JET -Z-R	vdc	9.0		11.0		
c	RCS JET -Z+R	vdc	9.0		11.0		
d	RCS JET +Z-R	vdc	9.0		11.0		
e	RCS JET +Y+R	vdc	9.0		11.0		
f	RCS JET -Y-R	vdc	9.0		11.0		
g	RCS JET -Y+R	vdc	9.0		11.0		
h	RCS JET +Y-R	vdc	9.0		11.0		
14	ENG ON	vdc	2.0		5.0		
16	ENG ON	vdc	9.0		11.0		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude (A)	volts	4.0		10.0		
	Pulse Width (B)	usec	2.5		6.0		
	Droop (D)	volts	▨		15% of A		
	Rise Time	usec	▨		0.2		
	Noise	volts	-4.0		+0.4		
	Backswing (C)	volts	▨		4.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12209
REV. F

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 pps)	usec	▨		1.0		
	DSKY Displays (Reacted as specified)						
	REMARKS:						

DATE 30 JUN 66

JOB CGC OUTPUT TEST | JDC 12209 REV. G PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30304	1,3	-	EA	-
B	9-1-66	30929	2	-	JP	-
C	11-10-66	31888	All	-	EA	-
D	3-9-67	33187	2	-	EA	-
E	5-4-67	33718	-	2	EA	-
F	6-1-67	33884	3	2	EA	-
G	8-10-67	34341	1	-	EA	-

REFERENCES PS-2015000

IMPORTANT Insure that connector assembly (2003099) is removed and W226-P1 is connected to CGC test connector before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL

1. Insure that the following lamps on the Test Control panel are lighted:
   - a. ISS STANDBY
   - b. CGC/LGC POWER ON
   - c. 400 CPS POWER ON

2. If the STBY lamp on the DSKY is not lighted, proceed to step 4. If the STBY lamp is lighted, perform step 3.

3. Press and hold the STBY pushbutton until the STBY lamp goes out. Perform the following DSKY operations:

a. Press		RSET
b. VERB 61		ENTR

4. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to CTS RDC. Set the RDC Interface panel switches as follows:
   - a. DE MARGINS to NORM
   - b. CH V METERS to DCVM
   - c. CHANNEL V to 601
   - d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbutton to turn them off.

6. Perform the following DSKY operations:

a. VERB 57	ENTR
b. 00011	ENTR

7. Observe that the DSKY displays the following:
   - a. Row 1 displays XX377
   - b. Row 3 displays 00005

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC OUTPUT TEST | JDC 12209 REV G PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	601	+X+P
b.	602	-X-P
c.	603	-X+P
d.	604	+X-P
e.	605	+X+Y
f.	606	-X-Y
g.	607	-X+Y
h.	608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   - a. Row 1 displays XX377
   - b. Row 3 displays 00006

10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.

11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	609	+Z+R
b.	610	-Z-R
c.	611	-Z+R
d.	612	+Z-R
e.	613	+Y+R
f.	614	-Y-R
g.	615	-Y+R
h.	616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   - a. Row 1 displays 1XXXX
   - b. Row 3 displays 00011

13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switches to 506 (ENG ON). Record the DCVM indication.

15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   - a. Row 1 displays 30000
   - b. Row 3 displays 00012

16. Set CHANNEL V switches to 506. Record the DCVM indication.

NOTE: Indications of step 17 and step 19 occur only with MAIN DSKY installed or with cable W-160 (P3) connected to the DSKY.

17. Record that following Monitor panel indicators are lighted:
   - a. SIV B INJ SEQ START
   - b. SIV B CUT OFF

18. Press the ENTR pushbutton on the DSKY.

19. Record that following Monitor panel indicators are not lighted:
   - a. SIV B INJ SEQ START
   - b. SIV B CUT OFF

DATE 30 JUN 66

JOB CGC OUTPUT TEST | JDC 12209 REV G PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

20. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01000		ENTR
c. 77777		ENTR
d. NOUN 15		ENTR
e. 77777		ENTR ENTR

21. Repeat the following DSKY operations until Row 3 indicates 01060.

a. 77777	ENTR ENTR

22. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 00413		ENTR
c. 01000		ENTR

23. Press the DL ENABLE and WORD RATE 50 PPS pushbuttons on XY Interface panel.

24. Set switches as follows:

XY Interface panel
   - a. CHANNEL T to 102 (DLNK DATA)
   - b. SCOPE to T

Oscilloscope panel
   - c. A to NORMAL DC
   - d. B to INVERTED DC
   - e. MODE to A + B

Insure the VOLT/DIV switches on Channel A and B are set to the same position.

Measure and record the oscilloscope indication. (See figure 1.)

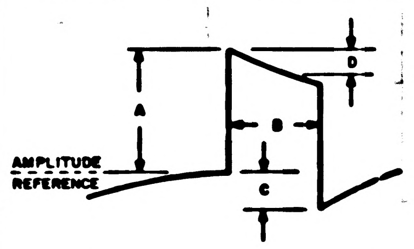

Figure 1. Pulse Diagram

25. Set the SCOPE switch to S→T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.

26. Press the WORD RATE 10 PPS and the WORD RATE 50 PPS pushbuttons, adjust the scope and repeat step 25.

27. Press the WORD RATE 300 PPS and the WORD RATE 10 PPS pushbuttons. When the KEY REL light flashes, press the KEY REL pushbutton on the DSKY. VERB 05 and NOUN 31 shall be displayed on the DSKY and Row 1 shall indicate 01105. The PROG lamp on the DSKY shall be lighted.

28. Perform the following DSKY operations:

a. VERB 11	NOUN 10	ENTR
b. 00033	ENTR	

Row 1 shall indicate X2XXX.

29. Press the DL ENABLE and WORD RATE 300 PPS pushbuttons and set the CHANNEL S and T switches to 101.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12209 JDC
REV. G
INITIAL TDRR 29882

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST

TITLE
SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	2.0		5.0		
b	RCS JET -X-P	vdc	2.0		5.0		
c	RCS JET -X+P	vdc	2.0		5.0		
d	RCS JET +X-P	vdc	2.0		5.0		
e	RCS JET +X+Y	vdc	2.0		5.0		
f	RCS JET -X-Y	vdc	2.0		5.0		
g	RCS JET -X+Y	vdc	2.0		5.0		
h	RCS JET +X-Y	vdc	2.0		5.0		
10.a	RCS JET +X+P	vdc	9.0		11.0		
b	RCS JET -X-P	vdc	9.0		11.0		
c	RCS JET -X+P	vdc	9.0		11.0		
d	RCS JET +X-P	vdc	9.0		11.0		
e	RCS JET +X+Y	vdc	9.0		11.0		
f	RCS JET -X-Y	vdc	9.0		11.0		
g	RCS JET -X+Y	vdc	9.0		11.0		
h	RCS JET +X-Y	vdc	9.0		11.0		
11.a	RCS JET +Z+R	vdc	2.0		5.0		
b	RCS JET -Z-R	vdc	2.0		5.0		
c	RCS JET -Z+R	vdc	2.0		5.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12209
REV. G

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	2.0		5.0		
e	RCS JET +Y+R	vdc	2.0		5.0		
f	RCS JET -Y-R	vdc	2.0		5.0		
g	RCS JET -Y+R	vdc	2.0		5.0		
h	RCS JET +Y-R	vdc	2.0		5.0		
13.a	RCS JET +Z+R	vdc	9.0		11.0		
b	RCS JET -Z-R	vdc	9.0		11.0		
c	RCS JET -Z+R	vdc	9.0		11.0		
d	RCS JET +Z-R	vdc	9.0		11.0		
e	RCS JET +Y+R	vdc	9.0		11.0		
f	RCS JET -Y-R	vdc	9.0		11.0		
g	RCS JET -Y+R	vdc	9.0		11.0		
h	RCS JET +Y-R	vdc	9.0		11.0		
14	ENG ON	vdc	2.0		5.0		
16	ENG ON	vdc	9.0		11.0		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude (A)	volts	4.0		10.0		
	Pulse Width (B)	usec	2.5		6.0		
	Droop (D)	volts	▨		15% of A		
	Rise Time	usec	▨		0.2		
	Noise	volts	-4.0		+0.4		
	Backswing (C)	volts	▨		4.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12209
REV. G

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 pps)	usec	▨		1.0		
	DSKY Displays (Reacted as specified)						
	REMARKS:						

DATE 30 JUN 66

JOB CGC OUTPUT TEST | JDC 12209 REV. H PAGE 1 OF 4

INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30304	1,3	-	EA	-
B	9-1-66	30929	2	-	JP	-
C	11-10-66	31888	All	-	EA	-
D	3-9-67	33187	2	-	EA	-
E	5-4-67	33718	-	2	EA	-
F	6-1-67	33884	3	2	EA	-
G	8-10-67	34341	1	-	EA	-
H	9-21-67	34669	3	2	EA	-

REFERENCES PS-2015000

IMPORTANT Insure that connector assembly (2003099) is removed and W226-P1 is connected to CGC test connector before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL

1. Insure that the following lamps on the Test Control panel are lighted:
   a. ISS STANDBY
   b. CGC/ LGC POWER ON
   c. 400 CPS POWER ON

2. If the STBY lamp on the DSKY is not lighted, proceed to step 4. If the STBY lamp is lighted, perform step 3.

3. Press and hold the STBY pushbutton until the STBY lamp goes out. Perform the following DSKY operations:

a. Press	RSET	
b. VERB 61	ENTR	

4. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to CTS RDC. Set the RDC Interface panel switches as follows:
   a. DE MARGINS to NORM
   b. CH V METERS to DCVM
   c. CHANNEL V to 601
   d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbutton to turn them off.

6. Perform the following DSKY operations:

a. VERB 57	ENTR
b. 00011	ENTR

7. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00005

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC OUTPUT TEST | JDC 12209 REV H PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

CHANNEL V	RCS JET
a. 601	+X+P
b. 602	-X-P
c. 603	-X+P
d. 604	+X-P
e. 605	+X+Y
f. 606	-X-Y
g. 607	-X+Y
h. 608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00006

10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.

11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

CHANNEL V	RCS JET
a. 609	+Z+R
b. 610	-Z-R
c. 611	-Z+R
d. 612	+Z-R
e. 613	+Y+R
f. 614	-Y-R
g. 615	-Y+R
h. 616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 1XXXX
   b. Row 3 displays 00011

13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switches to 506 (ENG ON). Record the DCVM indication.

15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 30000
   b. Row 3 displays 00012

16. Set CHANNEL V switches to 506. Record the DCVM indication.

NOTE: Indications of step 17 and step 19 occur only with MAIN DSKY installed or with cable W-160 (P3) connected to the DSKY.

17. Record that following Monitor panel indicators are lighted:
   a. SIV B INJ SEQ START
   b. SIV B CUT OFF

18. Press the ENTR pushbutton on the DSKY.

19. Record that following Monitor panel indicators are not lighted:
   a. SIV B INJ SEQ START
   b. SIV B CUT OFF

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JOB CGC OUTPUT TEST | JDC 12209 REV H PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

20. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01000		ENTR
c. 77777		ENTR
d. NOUN 15		ENTR
e. 77777		ENTR ENTR

21. Repeat the following DSKY operations until Row 3 indicates 01060.

a. 77777	ENTR ENTR

22. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 00413		ENTR
c. 01000		ENTR

23. Press the DL ENABLE and WORD RATE 50 PPS pushbuttons on XY Interface panel.

24. Set switches as follows:

XY Interface panel
   a. CHANNEL T to 102 (DLNK DATA)
   b. SCOPE to T

Oscilloscope panel
   c. A to NORMAL DC
   d. B to INVERTED DC
   e. MODE to A + B

Insure the VOLT/DIV switches on Channel A and B are set to the same position. Measure and record oscilloscope indications A through F (see figure 1) as follows:
   a. Amplitude as shown on figure
   b. Pulse width at 50% of amplitude
   c. Rise time from 10% to 90% of amplitude
   d. Backswing as shown on figure
   e. Droop measured at 2 microseconds
   f. Noise measured during pulse absence and measured with respect to amplitude reference.

25. Set the SCOPE switch to S→T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.

26. Press the WORD RATE 10 PPS and the WORD RATE 50 PPS pushbuttons, adjust the scope and repeat step 25.

27. Press the WORD RATE 300 PPS and the WORD RATE 10 PPS pushbuttons. When the KEY REL light flashes, press the KEY REL pushbutton on the DSKY. VERB 05 and NOUN 31 shall be displayed on the DSKY and Row 1 shall indicate 01105. The PROG lamp on the DSKY shall be lighted.

28. Perform the following DSKY operations:

a. VERB 11	NOUN 10	ENTR
b. 00033	ENTR	

Row 1 shall indicate X2XXX.

29. Press the DL ENABLE and WORD RATE 300 PPS pushbuttons and set the CHANNEL S and T switches to 101.

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JOB CGC OUTPUT TEST | JDC 12209 REV H PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

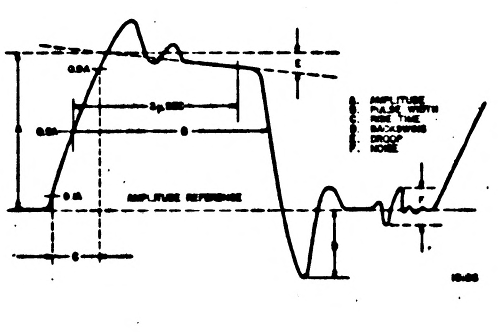

Figure 1. Pulse Diagram

DATE 30 JUN 66

FORM 00145
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12209
REV. H
INITIAL TDRR 29862

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	2.0		5.0		
b	RCS JET -X-P	vdc	2.0		5.0		
c	RCS JET -X+P	vdc	2.0		5.0		
d	RCS JET +X-P	vdc	2.0		5.0		
e	RCS JET +X+Y	vdc	2.0		5.0		
f	RCS JET -X-Y	vdc	2.0		5.0		
g	RCS JET -X+Y	vdc	2.0		5.0		
h	RCS JET +X-Y	vdc	2.0		5.0		
10.a	RCS JET +X+P	vdc	9.0		11.0		
b	RCS JET -X-P	vdc	9.0		11.0		
c	RCS JET -X+P	vdc	9.0		11.0		
d	RCS JET +X-P	vdc	9.0		11.0		
e	RCS JET +X+Y	vdc	9.0		11.0		
f	RCS JET -X-Y	vdc	9.0		11.0		
g	RCS JET -X+Y	vdc	9.0		11.0		
h	RCS JET +X-Y	vdc	9.0		11.0		
11.a	RCS JET +Z+R	vdc	2.0		5.0		
b	RCS JET -Z-R	vdc	2.0		5.0		
c	RCS JET -Z+R	vdc	2.0		5.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12209
REV. H

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	2.0		5.0		
e	RCS JET +Y-R	vdc	2.0		5.0		
f	RCS JET -Y-R	vdc	2.0		5.0		
g	RCS JET -Y-R	vdc	2.0		5.0		
h	RCS JET +Y-R	vdc	2.0		5.0		
13.a	RCS JET +Z+R	vdc	9.0		11.0		
b	RCS JET -Z-R	vdc	9.0		11.0		
c	RCS JET -Z-R	vdc	9.0		11.0		
d	RCS JET +Z-R	vdc	9.0		11.0		
e	RCS JET +Y-R	vdc	9.0		11.0		
f	RCS JET -Y-R	vdc	9.0		11.0		
g	RCS JET -Y-R	vdc	9.0		11.0		
h	RCS JET +Y-R	vdc	9.0		11.0		
14	ENG ON	vdc	2.0		5.0		
16	ENG ON	vdc	9.0		11.0		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude	volts	4.0		10.0		
	Pulse Width	usec	2.5		6.0		
	Rise Time	usec	▨		0.2		
	Backswing	volts	▨		4.0		
	Droop	volts	▨		15%of A		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12209
REV. H

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24 (cont)	Noise above reference	volts	▨		+0.4		
	Noise below reference	volts	-4.0		▨		
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 pps)	usec	▨		1.0		
	DSKY Displays (Reacted as specified)		▨		▨		
	REMARKS:						

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 **REV.** J **PAGE** 1 **OF** 4

INITIAL TDRR 29882 **D.S. PGS.** 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30304	1,3	-	EA	-
B	9-1-66	30929	2	-	JP	-
C	11-10-66	31888	All	-	EA	-
D	3-9-67	33187	2	-	EA	-
E	5-4-67	33718	-	2	EA	-
F	6-1-67	33884	3	2	EA	-
G	8-10-67	34341	1	-	EA	-
H	9-21-67	34669	3	2	EA	-
J	1-4-68	35354	1,2,3	3	EA 80	-

REFERENCES PS-2015000

IMPORTANT Insure that connector assembly (2003099) is removed and W226-P1 is connected to CGC test connector before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL

1. Insure that the following lamps on the Test Control panel are lighted:

a. ISS STANDBY

b. CGC/ LGC POWER ON

c. 400 CPS POWER ON

2. If the STBY lamp on the DSKY is not lighted, proceed to step 4. If the STBY lamp is lighted, perform step 3.

3. Press and hold the STBY pushbutton until the STBY lamp goes out. Perform the following DSKY operations:

a.	Press	RSET
b.	VERB 61	ENTR

4. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to CTS RDC. Set the RDC Interface panel switches as follows:

a. DE MARGINS to NORM

b. CHAN V METERS to DCVM

c. CHANNEL V to 601

d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbutton to turn them off.

6. Perform the following DSKY operations:

a.	VERB 57	ENTR
b.	00011	ENTR

7. Observe that the DSKY displays the following:

a. Row 1 displays XX377

b. Row 3 displays 00005

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 **REV** J **PAGE** 2 **OF** 4

SUBSYSTEM G & N SYSTEM

ASSY

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	601	+X+P
b.	602	-X-P
c.	603	-X+P
d.	604	+X-P
e.	605	+X+Y
f.	606	-X-Y
g.	607	-X+Y
h.	608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:

a. Row 1 displays XX377

b. Row 3 displays 00006

10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.

11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	609	+Z+R
b.	610	-Z-R
c.	611	-Z+R
d.	612	+Z-R
e.	613	+Y+R
f.	614	-Y-R
g.	615	-Y+R
h.	616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:

a. Row 1 displays 1XXXX

b. Row 3 displays 00011

13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switches to 506 (ENG ON). Record the DCVM indication.

15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:

a. Row 1 displays 30000

b. Row 3 displays 00012

16. Set CHANNEL V switches to 506. Record the DCVM indication.

NOTE: Indications of step 17 and step 19 occur only with MAIN DSKY installed or with cable W-160 (P3) connected to the DSKY.

17. Record that following Monitor panel indicators are lighted:

a. SIVB INJ SEQ START

b. SIVB CUT OFF

18. Press the ENTR pushbutton on the DSKY.

19. Record that following Monitor panel indicators are not lighted:

a. SIVB INJ SEQ START

b. SIVB CUT OFF

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JOB CGC OUTPUT TEST

JDC 12209 **REV** J **PAGE** 3 **OF** 4

SUBSYSTEM G & N SYSTEM

ASSY

20. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	01000		ENTR
c.	77777		ENTR
d.	NOUN 15		ENTR
e.	77777		ENTR ENTR

21. Repeat the following DSKY operations until Row 3 indicates 01060.

a.	77777	ENTR ENTR

22. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	00413		ENTR
c.	01000		ENTR

23. Press to light DL ENABLE and WORD RATE 50 PPS pushbuttons on XY Interface panel.

24. Set switches as follows:

XY Interface panel

a. CHANNEL T to 102 (DLNK DATA)

b. SCOPE to T

Oscilloscope panel

c. A to NORM DC

d. B to INVERT DC

e. MODE to A + B

Insure the VOLTS/DIV switches on Channel A and B are set to the same position. Measure and record oscilloscope indications A through F (see figure 1) as follows:

a. Amplitude as shown on figure

b. Pulse width at 50% of amplitude

c. Rise time from 10% to 90% of amplitude

d. Backswing as shown on figure

e. Droop measured at 2 microseconds

f. Noise measured during pulse absence and measured with respect to amplitude reference.

25. Set the SCOPE switch to S ⟶ T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.

26. Press to light WORD RATE 10 PPS pushbutton and press to extinguish WORD RATE 50 PPS pushbutton. Adjust oscilloscope and repeat step 25.

27. Press to light WORD RATE 300 PPS pushbutton and press to extinguish WORD RATE 10 PPS pushbutton. When KEY REL indicator on DSKY flashes, press KEY REL pushbutton. Observe DSKY displays VERB 05 and NOUN 31, Row 1 indicates 01105, and PROG indicator is lighted.

28. Perform the following DSKY operations:

a.	VERB 11	NOUN 10	ENTR
b.	00033	ENTR	

Row 1 shall indicate X2XXX.

29. Press to extinguish DL ENABLE and WORD RATE 300 PPS pushbuttons and set CHANNEL S and CHANNEL T switches to 101.

30. Perform the following DSKY operation:

VERB 36	ENTR

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 **REV** J **PAGE** 4 **OF** 4

SUBSYSTEM G & N SYSTEM

ASSY

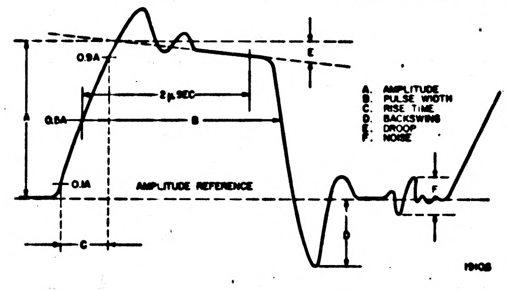

Figure 1. Pulse Diagram

DATE 30 JUN 66

FORM 001-5
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12209
REV. J
INITIAL TDRR 29882

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ____	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	2.0		5.0		
b	RCS JET -X-P	vdc	2.0		5.0		
c	RCS JET -X+P	vdc	2.0		5.0		
d	RCS JET +X-P	vdc	2.0		5.0		
e	RCS JET +X+Y	vdc	2.0		5.0		
f	RCS JET -X-Y	vdc	2.0		5.0		
g	RCS JET -X+Y	vdc	2.0		5.0		
h	RCS JET +X-Y	vdc	2.0		5.0		
10.a	RCS JET +X+P	vdc	9.0		11.0		
b	RCS JET -X-P	vdc	9.0		11.0		
c	RCS JET -X+P	vdc	9.0		11.0		
d	RCS JET +X-P	vdc	9.0		11.0		
e	RCS JET +X+Y	vdc	9.0		11.0		
f	RCS JET -X-Y	vdc	9.0		11.0		
g	RCS JET -X+Y	vdc	9.0		11.0		
h	RCS JET +X-Y	vdc	9.0		11.0		
11.a	RCS JET +Z+R	vdc	2.0		5.0		
b	RCS JET -Z-R	vdc	2.0		5.0		
c	RCS JET -Z+R	vdc	2.0		5.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12209
REV. J

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	2.0		5.0		
e	RCS JET +Y+R	vdc	2.0		5.0		
f	RCS JET -Y-R	vdc	2.0		5.0		
g	RCS JET -Y+R	vdc	2.0		5.0		
h	RCS JET +Y-R	vdc	2.0		5.0		
13.a	RCS JET +Z+R	vdc	9.0		11.0		
b	RCS JET -Z-R	vdc	9.0		11.0		
c	RCS JET -Z+R	vdc	9.0		11.0		
d	RCS JET +Z-R	vdc	9.0		11.0		
e	RCS JET +Y+R	vdc	9.0		11.0		
f	RCS JET -Y-R	vdc	9.0		11.0		
g	RCS JET -Y+R	vdc	9.0		11.0		
h	RCS JET +Y-R	vdc	9.0		11.0		
14	ENG ON	vdc	2.0		5.0		
16	ENG ON	vdc	9.0		11.0		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude	volts	4.0		10.0		
	Pulse Width	usec	2.5		6.0		
	Rise Time	usec	▨		0.2		
	Backswing	volts	▨		4.0		
	Droop	volts	▨		15% of A		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12209
REV. J

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24 (cont)	Noise above reference	volts	▨		+0.4		
	Noise below reference	volts	-4.0		▨		
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 PPS)	usec	▨		1.0		
7, 9, 12, 15, 27, and 28	DSKY Displays (Reacted as specified)	▨	▨		▨		
	REMARKS:						

DATE 30 JUN 66

JOB CGC OUTPUT TEST

JDC 12209 REV. K PAGE 1 OF 4
INITIAL TDRR 29882 D.S. PGS. 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES PS-2015000
			JDC	D.S.	MIT	NASA	
A	7-28-66	30304	1,3	-	EA	-	IMPORTANT Insure that connector assembly (2003099) is removed and W226-P1 is connected to CGC test connector before proceeding with this JDC.
B	9-1-66	30929	2	-	JP	-	
C	11-10-66	31888	All	-	EA	-	
D	3-9-67	33187	2	-	EA	-	
E	5-4-67	33718	-	2	EA	-	
F	6-1-67	33884	3	2	EA	-	INTERVAL
G	8-10-67	34341	1	-	EA	-	
H	9-21-67	34669	3	2	EA	-	TOOLS AND MATERIAL
J	1-4-68	35354	1,2,3	3	EA	-	
K	6-17-68	36352	1	1,2	EA	-	

NOTE: If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

1. Insure that the following lamps on the Test Control panel are lighted:

a. ISS STANDBY

b. CGC/LGC POWER ON

c. 400 CPS POWER ON

d. Zero DCVM meter on CTS Power Control panel and then set RANGE SELECT switch to 40V.

e. Verify that AGC ALARMS #6 on Logic Drawer No. 1 is lighted.

2. If the STBY lamp on the DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the System log the number of times pressed.

3. Perform following DSKY operations:

a. Press ENTR

b. VERB 61 ENTR

4. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to CTS RDC. Set the RDC Interface panel switches as follows:

a. DE MARGINS to NORM

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

b. CHAN V METERS to DCVM

c. CHANNEL V to 601

d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbutton to turn them off.

6. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00011 ENTR

7. Observe that the DSKY displays the following:

a. Row 1 displays XX377

b. Row 3 displays 00005

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	601	+X-P
b.	602	-X-P
c.	603	-X+P
d.	604	+X-P
e.	605	+X+Y
f.	606	-X-Y
g.	607	-X+Y
h.	608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:

a. Row 1 displays XX377

b. Row 3 displays 00006

10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.

11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	609	+Z+R
b.	610	-Z-R
c.	611	-Z+R
d.	612	+Z-R
e.	613	+Y+R
f.	614	-Y-R
g.	615	-Y+R
h.	616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:

a. Row 1 displays 1XXXX

b. Row 3 displays 00011

13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switches to 506 (ENG ON). Record the DCVM indication.

15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:

a. Row 1 displays 30000

b. Row 3 displays 00012

16. Set CHANNEL V switches to 506. Record the DCVM indication.

NOTE: Indications of step 17 and step 19 occur only with MAIN DSKY installed or with cable W-160 (P3) connected to the DSKY.

17. Record that following Monitor panel indicators are lighted:

a. SIVB INJ SEQ START

b. SIVB CUT OFF

18. Press the ENTR pushbutton on the DSKY.

19. Record that following Monitor panel indicators are not lighted:

a. SIVB INJ SEQ START

b. SIVB CUT OFF

20. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 01000 ENTR

c. 77777 ENTR

d. NOUN 15 ENTR

e. 77777 ENTR ENTR

21. Repeat the following DSKY operations until Row 3 indicates 01060.

a. 77777 ENTR ENTR

22. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 00413 ENTR

c. 01000 ENTR

23. Press to light DL ENABLE and WORD RATE 50 PPS pushbuttons on XY Interface panel.

24. Set switches as follows:

XY Interface panel

a. CHANNEL T to 102 (DLNK DATA)

b. SCOPE to T

Oscilloscope panel

c. A to NORM DC

d. B to INVERT DC

e. MODE to A + B

Insure the VOLTS/DIV switches on Channel A and B are set to the same position. Measure and record oscilloscope indications A through F (see figure 1) as follows:

a. Amplitude as shown on figure

b. Pulse width at 50% of amplitude

c. Rise time from 10% to 90% of amplitude

d. Backswing as shown on figure

e. Droop measured at 2 microseconds

f. Noise measured during pulse absence and measured with respect to amplitude reference.

25. Set the SCOPE switch to S —T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.

26. Press to light WORD RATE 10 PPS pushbutton and press to extinguish WORD RATE 50 PPS pushbutton. Adjust oscilloscope and repeat step 25.

27. Press to light WORD RATE 300 PPS pushbutton and press to extinguish WORD RATE 10 PPS pushbutton. When KEY REL indicator on DSKY flashes, press KEY REL

---

pushbutton. Observe DSKY displays VERB 05 and NOUN 31, Row 1 indicates 01105, and PROG indicator is lighted.

28. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00033 ENTR

Row 1 shall indicate X2XXX.

29. Press to extinguish DL ENABLE and WORD RATE 300 PPS pushbuttons and set CHANNEL S and CHANNEL T switches to 101.

30. Perform the following DSKY operations:

VERB 36 ENTR

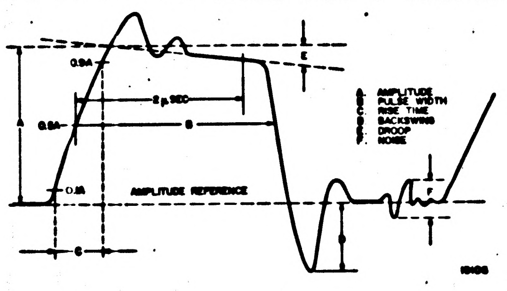

Figure 1. Pulse Diagram

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12209
REV. K
INITIAL TDRR 29981

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	3.0		6.0		
b	RCS JET -X-P	vdc	3.0		6.0		
c	RCS JET -X+P	vdc	3.0		6.0		
d	RCS JET +X-P	vdc	3.0		6.0		
e	RCS JET +X+Y	vdc	3.0		6.0		
f	RCS JET -X-Y	vdc	3.0		6.0		
g	RCS JET -X+Y	vdc	3.0		6.0		
h	RCS JET +X-Y	vdc	3.0		6.0		
10.a	RCS JET +X+P	vdc	9.1		10.1		
b	RCS JET -X-P	vdc	9.1		10.1		
c	RCS JET -X+P	vdc	9.1		10.1		
d	RCS JET +X-P	vdc	9.1		10.1		
e	RCS JET +X+Y	vdc	9.1		10.1		
f	RCS JET -X-Y	vdc	9.1		10.1		
g	RCS JET -X+Y	vdc	9.1		10.1		
h	RCS JET +X-Y	vdc	9.1		10.1		
11.a	RCS JET +Z+R	vdc	3.0		6.0		
b	RCS JET -Z-R	vdc	3.0		6.0		
c	RCS JET -Z+R	vdc	3.0		6.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12209
REV. K

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	3.0		6.0		
e	RCS JET +Y+R	vdc	3.0		6.0		
f	RCS JET -Y-R	vdc	3.0		6.0		
g	RCS JET -Y+R	vdc	3.0		6.0		
h	RCS JET +Y-R	vdc	3.0		6.0		
13.a	RCS JET +Z+R	vdc	9.1		10.1		
b	RCS JET -Z-R	vdc	9.1		10.1		
c	RCS JET -Z+R	vdc	9.1		10.1		
d	RCS JET +Z-R	vdc	9.1		10.1		
e	RCS JET +Y+R	vdc	9.1		10.1		
f	RCS JET -Y-R	vdc	9.1		10.1		
g	RCS JET -Y+R	vdc	9.1		10.1		
h	RCS JET +Y-R	vdc	9.1		10.1		
14	ENG ON	vdc	3.0		6.0		
16	ENG ON	vdc	9.1		10.1		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude	volts	4.0		10.0		
	Pulse Width	usec	2.5		6.0		
	Rise Time	usec	▨		0.2		
	Backswing	volts	▨		6.0		
	Droop	volts	▨		15% of A		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12209
REV. K

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24 (cont)	Noise above reference	volts	▨		+0.4		
	Noise below reference	volts	-4.0		▨		
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 PPS)	usec	▨		1.0		
7, 9, 12, 15, 27, and 28	DSKY Displays (Reacted as specified)	▨	▨		▨		
	REMARKS:						

DATE 30 JUN 66

JOB CGC OUTPUT TEST | JDC 12209 REV. L PAGE 1 OF 4
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, the Main Engine command and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	7-28-66	30304	1,3	-	EA	-
B	9-1-66	30929	2	-	JP	-
C	11-10-66	31888	All	-	EA	-
D	3-9-67	33187	2	-	EA	-
E	5-4-67	33718	-	2	EA	-
F	6-1-67	33884	3	2	EA	-
G	8-10-67	34341	1	-	EA	-
H	9-21-67	34669	3	2	EA	-
J	1-4-68	35354	1,2,3	3	EA	-
K	6-17-68	36352	1	1,2	EA	-
L	3-11-69	37402	1,3,4	-	EA	-

REFERENCES PS-2015000

IMPORTANT Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL

NOTE: If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

NOTE: Insure that jumpers are connected from CLOCK connector on the CTS Interface Signals patch board to the CLOCK connector on the Frequency Counter and from the EXT SY-2 connector on the XY Interface panel to the Oscilloscope CLOCK connector on the patch board.

1. Insure that the following lamps on the Test Control panel are lighted:
   a. ISS STANDBY
   b. CGC/LGC POWER ON
   c. 400 CPS POWER ON
   d. Zero DCVM meter on CTS Power Control panel and then set RANGE SELECT switch to 40V.
2. If the STBY lamp on the DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the System log the number of times pressed.
3. Perform following DSKY operations:
   a. Deleted

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM 0015A
Chg. 3-15-65

JOB CGC OUTPUT TEST | JDC 12209 REV L PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

b. VERB 61 ENTR

4. Enter VERB 36 and press the ENTR pushbutton on the DSKY. Press RSET pushbutton.

CTS SWITCH INITIALIZATION

5. Set the VOLTAGE SELECT switch on the Power Control panel to CTS RDC. Set the RDC Interface panel switches as follows:
   a. DE MARGINS to NORM
   b. CHAN V METERS to DCVM
   c. CHANNEL V to 601
   d. Check to see that no LOAD pushbuttons are lighted. If any are, push the pushbutton to turn them off.
6. Perform the following DSKY operations:
   a. VERB 57 ENTR
   b. 00011 ENTR
7. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00005

RCS JET ON-OFF TEST

8. Set CHANNEL V switches to the positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	601	+X+P
b.	602	-X-P
c.	603	-X+P
d.	604	+X-P
e.	605	+X+Y
f.	606	-X-Y
g.	607	-X+Y
h.	608	+X-Y

9. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays XX377
   b. Row 3 displays 00006
10. Set CHANNEL V switches to the positions specified in step 8 and record the DCVM indication for each position.
11. Set CHANNEL V switches to positions specified below and record the DCVM indication for each position:

	CHANNEL V	RCS JET
a.	609	+Z+R
b.	610	-Z-R
c.	611	-Z+R
d.	612	+Z-R
e.	613	+Y+R
f.	614	-Y-R
g.	615	-Y+R
h.	616	+Y-R

12. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 1XXXX
   b. Row 3 displays 00011
13. Set CHANNEL V switches to the positions specified in step 11 and record the DCVM indications for each position.

ENG ON-OFF TEST

14. Set CHANNEL V switches to 506 (ENG ON). Record the DCVM indication.

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JOB CGC OUTPUT TEST | JDC 12209 REV L PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

15. Press the ENTR pushbutton on the DSKY. Observe that the DSKY displays the following:
   a. Row 1 displays 30000
   b. Row 3 displays 00012
16. Set CHANNEL V switches to 506. Record the DCVM indication.

    NOTE: Indications of step 17 and step 19 occur only with MAIN DSKY installed or with cable W-160 (P3) connected to the DSKY.

17. Record that following Monitor panel indicators are lighted:
   a. SIVB INJ SEQ START
   b. SIVB CUT OFF
18. Press the ENTR pushbutton on the DSKY.
19. Record that following Monitor panel indicators are not lighted:
   a. SIVB INJ SEQ START
   b. SIVB CUT OFF
20. Perform the following DSKY operations:
   a. VERB 21 NOUN 01 ENTR
   b. 01000 ENTR
   c. 77777 ENTR
   d. NOUN 15 ENTR
   e. 77777 ENTR ENTR
21. Repeat the following DSKY operations until Row 3 indicates 01060.
   a. 77777 ENTR ENTR
22. Perform the following DSKY operations:
   a. VERB 21 NOUN 01 ENTR
   b. 00413 ENTR
   c. 01000 ENTR
23. Press to light DL ENABLE and WORD RATE 50 PPS pushbuttons on XY Interface panel.
24. Set switches as follows:

    XY Interface panel
   a. CHANNEL T to 102 (DLNK DATA)
   b. SCOPE to T

    Oscilloscope panel
   c. A to NORM DC
   d. B to INVERT DC
   e. MODE to A + B

Insure the VOLTS/DIV switches on Channel A and B are set to the same position. Measure and record oscilloscope indications A through F (see figure 1) as follows:
   a. Amplitude as shown on figure
   b. Pulse width at 50% of amplitude
   c. Rise time from 10% to 90% of amplitude
   d. Backswing as shown on figure
   e. Droop measured at 2 microseconds
   f. Noise measured during pulse absence and measured with respect to amplitude reference.

25. Set the SCOPE switch to S ⟶ T and CHANNEL S Switch to 307 (DLNK SYNC). Measure and record the delay of one of the DLNK DATA pulses with respect to the corresponding DLNK SYNC pulse.

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JOB CGC OUTPUT TEST | JDC 12209 REV L PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

26. Press to light WORD RATE 10 PPS pushbutton and press to extinguish WORD RATE 50 PPS pushbutton. Adjust oscilloscope and repeat step 25.
27. Press to light WORD RATE 300 PPS pushbutton and press to extinguish WORD RATE 10 PPS pushbutton and observe PROG indication on DSKY is lighted. When KEY REL indicator on DSKY flashes, press KEY REL pushbutton. Observe DSKY displays VERB 05 and NOUN 31, Row 1 indicates 01105, and PROG indicator is lighted.
28. Perform the following DSKY operations:
   a. VERB 11 NOUN 10 ENTR
   b. 00033 ENTR

Row 1 shall indicate X2XXX.

29. Press to extinguish WORD RATE 300 PPS pushbutton and press to light WORD RATE 50 PPS pushbutton. Set CHANNEL S and CHANNEL T switches to 101.
30. Perform the following DSKY operation:
   a. VERB 36 ENTR

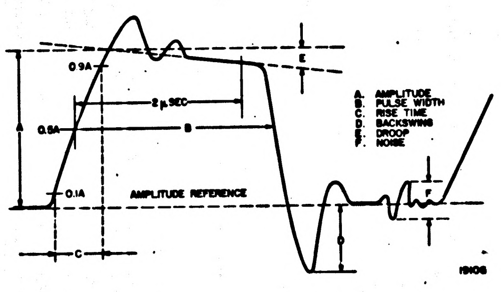

Figure 1. Pulse Diagram

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12209
REV. L
INITIAL TDRR 29882

JOB CGC OUTPUT TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE

NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION ______ APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
8.a	RCS JET +X+P	vdc	3.0		6.0		
b	RCS JET -X-P	vdc	3.0		6.0		
c	RCS JET -X+P	vdc	3.0		6.0		
d	RCS JET +X-P	vdc	3.0		6.0		
e	RCS JET +X+Y	vdc	3.0		6.0		
f	RCS JET -X-Y	vdc	3.0		6.0		
g	RCS JET -X+Y	vdc	3.0		6.0		
h	RCS JET +X-Y	vdc	3.0		6.0		
10.a	RCS JET +X+P	vdc	9.1		10.1		
b	RCS JET -X-P	vdc	9.1		10.1		
c	RCS JET -X+P	vdc	9.1		10.1		
d	RCS JET +X-P	vdc	9.1		10.1		
e	RCS JET +X+Y	vdc	9.1		10.1		
f	RCS JET -X-Y	vdc	9.1		10.1		
g	RCS JET -X+Y	vdc	9.1		10.1		
h	RCS JET +X-Y	vdc	9.1		10.1		
11.a	RCS JET +Z+R	vdc	3.0		6.0		
b	RCS JET -Z-R	vdc	3.0		6.0		
c	RCS JET -Z+R	vdc	3.0		6.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12209
REV. L

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	3.0		6.0		
e	RCS JET +Y+R	vdc	3.0		6.0		
f	RCS JET -Y-R	vdc	3.0		6.0		
g	RCS JET -Y+R	vdc	3.0		6.0		
h	RCS JET +Y-R	vdc	3.0		6.0		
13.a	RCS JET +Z+R	vdc	9.1		10.1		
b	RCS JET -Z-R	vdc	9.1		10.1		
c	RCS JET -Z+R	vdc	9.1		10.1		
d	RCS JET +Z-R	vdc	9.1		10.1		
e	RCS JET +Y+R	vdc	9.1		10.1		
f	RCS JET -Y-R	vdc	9.1		10.1		
g	RCS JET -Y+R	vdc	9.1		10.1		
h	RCS JET +Y-R	vdc	9.1		10.1		
14	ENG ON	vdc	3.0		6.0		
16	ENG ON	vdc	9.1		10.1		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude	volts	4.0		10.0		
	Pulse Width	usec	2.5		6.0		
	Rise Time	usec	▨		0.2		
	Backswing	volts	▨		6.0		
	Droop	volts	▨		15% of A		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12209
REV. L

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24 (cont)	Noise above reference	volts	▨		+0.4		
	Noise below reference	volts	-4.0		▨		
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 PPS)	usec	▨		1.0		
7, 9, 12, 15, 27, and 28	DSKY Displays (Reacted as specified)	▨	▨		▨		
	REMARKS:						

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12209
REV. -

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11.d	RCS JET +Z-R	vdc	2.0		5.0		
e	RCS JET +Y+R	vdc	2.0		5.0		
f	RCS JET -Y-R	vdc	2.0		5.0		
g	RCS JET -Y+R	vdc	2.0		5.0		
h	RCS JET +Y-R	vdc	2.0		5.0		
13.a	RCS JET +Z+R	vdc	9.0		11.0		
b	RCS JET -Z-R	vdc	9.0		11.0		
c	RCS JET -Z+R	vdc	9.0		11.0		
d	RCS JET +Z-R	vdc	9.0		11.0		
e	RCS JET +Y+R	vdc	9.0		11.0		
f	RCS JET -Y-R	vdc	9.0		11.0		
g	RCS JET -Y+R	vdc	9.0		11.0		
h	RCS JET +Y-R	vdc	9.0		11.0		
14	ENG ON	vdc	2.0		5.0		
16	ENG ON	vdc	9.0		11.0		
17.a	SIVB INJ SEQ START lamp	▨	lighted		▨		
17.b	SIVB CUTOFF lamp	▨	lighted		▨		
19.a	SIVB INJ SEQ START lamp	▨	not lighted		▨		
19.b	SIVB CUTOFF lamp	▨	not lighted		▨		
24	Amplitude	volts	5.0		9.0		
	Pulse Width	usec	2.0		6.0		
	Droop	volts	▨		+A/5		
	Rise Time	usec	▨		0.2		
	Noise	volts	-6.0		+0.4		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12209
REV. -

JOB CGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	DLNK DATA-SYNC delay time	usec	▨		1.0		
26	DLNK DATA-SYNC delay time (10 pps)	usec	▨		1.0		
	DSKY Displays (Reacted as specified)						
	REMARKS:						

DATE ________

JOB CGC INPUT TEST | JDC 12210 REV. A PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	6-6-67	33906	2	-	EA	-	
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

1. Insure that the ISS is in the Standby condition and that the CGC and 115V 400 CPS pushbuttons are ON.

2. Set the DE MARGINS switch to NORM on the RDC panel of the CTS.

3. Insure that the following pushbuttons on the RDC panel are not lighted.

CH30-14/INO-14 through CH30-1/INO-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press pushbuttons CH30-6/IN0-6 through CH30-1/IN0-1 lighting each specified pushbutton. Row 1 of the DSKY shall indicate 37700.

6. Press pushbuttons CH30-6/IN0-6 through CH30-1/IN0-1. Each pushbutton specified shall not be lighted. Row 1 of the DSKY shall indicate 37777.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC INPUT TEST | JDC 12210 REV A PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

7. Perform the following DSKY operations:

a. NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press pushbuttons CH31-14/IN2-14 through CH31-1/IN2-1 lighting each specified pushbutton. Row 1 of the DSKY shall indicate 40000.

9. Press pushbuttons CH31-14/IN2-14 through CH31-1/IN2-1. Each specified pushbutton shall not be lighted. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set the Attitude Impulse Hand Control on the Indicator Control panel for the following positions and observe Row 1 of the DSKY for proper indications:

	Attitude Impulse Hand Control Position	DSKY Indication
a.	Up	77775
b.	Down	77776
c.	Left	77737
d.	Right	77757
e.	Clockwise	77773
f.	Counterclockwise	77767

12. Press pushbutton CH32-11/IN3-11. Row 1 of the DSKY shall indicate 75777.

13. Press pushbutton CH32-11/IN3-11. Row 1 of the DSKY shall indicate 77777.

UPLINK TEST

14. Make the following switch settings:

TAPE READER to ON
Press TAPE PREPARE pushbutton
TAPE PUNCH to ON
Press TAPE FREE RUN pushbutton
Press TAPE READER pushbutton
Press NEGATIVE pushbutton
Press POSITIVE pushbutton

15. Using the "0" and "1" keys on the Octal Keyboard, make a tape by punching the following from left to right. This tape should be prepared very carefully to insure a successful test.

a. 100010111010001
b. Press STOP CODE pushbutton

16. Set the TAPE PUNCH switch to OFF.

17. Install the tape in the Tape Reader and make the following switch settings:

COUNTERS to Position 9
Press AGC INPUT COUNTERS pushbutton
Press CH33-10 pushbutton
UPLINK switch on the Indicator Control panel to ACCEPT

DATE 30 JUN 66

JOB CGC INPUT TEST | JDC 12210 REV A PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

18. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

19. Press the EXECUTE pushbutton. When the tape stops, perform the following DSKY operations:

a. VERB 01 NOUN 01 ENTR
b. 00045 ENTR

Row 1 shall indicate 42721.

20. Set the CONTINUITY TEST selector on the Test Selector panel to position 9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 291.

21. Press the CONTINUITY TEST pushbutton and observe an indication of 10 to 15 volts dc on the DVM.

22. Press the CONTINUITY TEST pushbutton. The pushbutton shall go out.

23. Turn off all switches set to on in steps 14 through 19.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12210
REV. A
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE
SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 15, 19, 21, 22, and 23	Displays (Reacted as specified)						

DATE 30 JUN 66

JOB CGC INPUT TEST | **JDC** 12210 **REV.** B **PAGE** 1 **OF** 3
INITIAL TDRR 29882 **D.S. PGS** 1

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Ⓜ

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	6-6-67	33906	2	-	EA	-
B	6-30-67	34070	All	All	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

CH30-14/INO-14 through CH30-1/INO-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

7. Perform the following DSKY operations:

a. NOUN 10 ENTR
b. 00031 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM 0011[illegible]
Orig. 3-18-66

JOB CGC INPUT TEST | **JDC** 12210 **REV** B **PAGE** 2 **OF** 3

SUBSYSTEM G & N SYSTEM | **ASSY**

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

	Attitude Impulse Hand Control Position	DSKY Indication
a.	Up	77775
b.	Down	77776
c.	Left	77737
d.	Right	77757
e.	Clockwise	77773
f.	Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

UPLINK TEST

NOTE: Perform step 14 if ECP 518 has been incorporated: otherwise proceed to step 15.

14. Press and hold STBY pushbutton on DSKY. Observe Row 1 indicates 57777. Release STBY pushbutton.

15. Set Power switch on Tape Reader panel to ON.

16. Set Power switch on Tape Perforator panel to ON.

17. Press TAPE PREPARE and TAPE FREE RUN pushbuttons on Programmer and Monitor panel. TAPE PREPARE and TAPE FREE RUN indicators shall light.

18. Press TAPE READER, NEGATIVE, and POSITIVE pushbuttons on XY Interface panel. TAPE READER, NEGATIVE, and POSITIVE indicators shall light.

19. Set NBSQ switch on Logic Drawer No. 2 panel to ON.

20. Using the "0" and "1" keys on the Octal Keyboard of the Programmer and Monitor panel, make a tape by punching the following from left to right. This tape should be prepared very carefully to insure a successful test:

100010111010001

21. Press STOP CODE pushbutton on Programmer and Monitor panel.

22. Set Power switch on Tape Perforator panel to OFF.

DATE 30 JUN 66

JOB CGC INPUT TEST | **JDC** 12210 **REV** B **PAGE** 3 **OF** 3

SUBSYSTEM G & N SYSTEM | **ASSY**

23. Install tape in Tape Reader panel.

24. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

25. Press AGC INPUT-CTR pushbutton on Programmer and Monitor panel. AGC INPUT-CTR indicator shall light.

26. Press CH33-10 pushbutton on RDC Interface panel. CH33-10 indicator shall light.

27. Set NBSQ switch on Logic Drawer No. 2 panel to OFF.

28. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

29. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

30. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, perform following DSKY operations:

a. VERB 01 NOUN 01 ENTR
b. 00045 ENTR

Row 1 shall indicate 42721.

31. Set CONTINUITY TEST switch on Test Selector panel to 9. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291.

32. Press CONTINUITY TEST pushbutton on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

33. Press the CONTINUITY TEST pushbutton. The pushbutton shall go out.

34. Turn off all switches set to on in steps 15 through 30.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

NO. 12210 JDC
REV. B
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 17, 18, 25, 26, 30, 32, 33, and 34	Displays (Reacted as specified)						

DATE 30 JUN 66

JOB CGC INPUT TEST

JDC 12210 REV. C PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
Ⓜ A	6-6-67	33906	2	-	EA	-	
Ⓜ B	6-30-67	34070	All	All	EA	-	
C	7-27-67	34246	3	-	EA	-	IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

1. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

CH30-14/IN0-14 through CH30-1/IN0-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

7. Perform the following DSKY operations:

a. NOUN 10 ENTR
b. 00031 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC INPUT TEST

JDC 12210 REV C PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

Attitude Impulse Hand Control Position	DSKY Indication
a. Up	77775
b. Down	77776
c. Left	77737
d. Right	77757
e. Clockwise	77773
f. Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

UPLINK TEST

NOTE: Perform step 14 if ECP 518 has been incorporated; otherwise proceed to step 15.

14. Press and hold STBY pushbutton on DSKY. Observe Row 1 indicates 57777. Release STBY pushbutton.

15. Set Power switch on Tape Reader panel to ON.

16. Set Power switch on Tape Perforator panel to ON.

17. Press TAPE PREPARE and TAPE FREE RUN pushbuttons on Programmer and Monitor panel. TAPE PREPARE and TAPE FREE RUN indicators shall light.

18. Press TAPE READER, NEGATIVE, and POSITIVE pushbuttons on XY Interface panel. TAPE READER, NEGATIVE, and POSITIVE indicators shall light.

19. Set NISQ switch on Logic Drawer No. 2 panel to ON.

20. Using the "0" and "1" keys on the Octal Keyboard of the Programmer and Monitor panel, make a tape by punching the following from left to right. This tape should be prepared very carefully to insure a successful test:

100010111010001

21. Press STOP CODE pushbutton on Programmer and Monitor panel.

22. Set Power switch on Tape Perforator panel to OFF.

DATE 30 JUN 66

JOB CGC INPUT TEST

JDC 12210 REV C PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

23. Install tape in Tape Reader panel.

24. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

25. Press AGC INPUT-CTR pushbutton on Programmer and Monitor panel. AGC INPUT-CTR indicator shall light.

26. Press CH33-10 pushbutton on RDC Interface panel. CH33-10 indicator shall light.

27. Set NISQ switch on Logic Drawer No. 2 panel to OFF, then sequentially press PROCEED (first), then ALARM RESET pushbuttons on Programmer and Monitor panel.

28. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

29. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

30. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, perform following DSKY operations:

a. VERB 01 NOUN 01 ENTR
b. 00045 ENTR

Row 1 shall indicate 42721.

31. Set CONTINUITY TEST switch on Test Selector panel to 9. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291.

32. Press CONTINUITY TEST pushbutton on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

33. Press the CONTINUITY TEST pushbutton. The pushbutton shall go out.

34. Turn off all switches set to on in steps 15 through 30.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 12210 JDC
REV. C
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE

SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 17, 18, 25, 26, 30, 32, 33, and 34	Displays (Reacted as specified)						

DATE 30 JUN 66

JOB CGC INPUT TEST | JDC 12210 REV. D PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
Ⓜ A	6-6-67	33906	2	-	EA	-
Ⓜ B	6-30-67	34070	All	All	EA	-
Ⓜ C	7-27-67	34246	3	-	EA	-
D	8-10-67	34342	1	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

1. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

CH30-14/IN0-14 through CH30-1/IN0-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC INPUT TEST | JDC 12210 REV D PAGE 2 OF 3
SUBSYSTEM G & N SYSTEM | ASSY

7. Perform the following DSKY operations:

a. NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

	Attitude Impulse Hand Control Position	DSKY Indication
a.	Up	77775
b.	Down	77776
c.	Left	77737
d.	Right	77757
e.	Clockwise	77773
f.	Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

UPLINK TEST

NOTE: Perform step 14 if ECP 518 has been incorporated; otherwise proceed to step 15.

14. Press and hold STBY pushbutton on DSKY. Observe Row 1 indicates 57777. Release STBY pushbutton.

15. Set Power switch on Tape Reader panel to ON.

16. Set Power switch on Tape Perforator panel to ON.

17. Press TAPE PREPARE and TAPE FREE RUN pushbuttons on Programmer and Monitor panel. TAPE PREPARE and TAPE FREE RUN indicators shall light.

18. Press TAPE READER, NEGATIVE, and POSITIVE pushbuttons on XY Interface panel. TAPE READER, NEGATIVE, and POSITIVE indicators shall light.

19. Set NISQ switch on Logic Drawer No. 2 panel to ON.

20. Using the "0" and "1" keys on the Octal Keyboard of the Programmer and Monitor panel, make a tape by punching the following from left to right. This tape should be prepared very carefully to insure a successful test:

100010111010001

21. Press STOP CODE pushbutton on Programmer and Monitor panel.

22. Set Power switch on Tape Perforator panel to OFF.

DATE 30 JUN 66

JOB CGC INPUT TEST | JDC 12210 REV D PAGE 3 OF 3
SUBSYSTEM G & N SYSTEM | ASSY

23. Install tape in Tape Reader panel.

24. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

25. Press AGC INPUT-CTR pushbutton on Programmer and Monitor panel. AGC INPUT-CTR indicator shall light.

26. Press CH33-10 pushbutton on RDC Interface panel. CH33-10 indicator shall light.

27. Set NISQ switch on Logic Drawer No. 2 panel to OFF, then sequentially press PROCEED (first), then ALARM RESET pushbuttons on Programmer and Monitor Panel.

28. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

29. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

30. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, perform following DSKY operations:

a. VERB 01 NOUN 01 ENTR
b. 00045 ENTR

Row 1 shall indicate 42721.

31. Set CONTINUITY TEST switch on Test Selector panel to 9. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291.

32. Press CONTINUITY TEST pushbutton on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

33. Press the CONTINUITY TEST pushbutton. The pushbutton shall go out.

34. Turn off all switches set to on in steps 15 through 30.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12210
REV. D
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 17, 18, 25, 26, 30, 32, 33, and 34	Displays (Reacted as specified)						

DATE 30 JUN 66

JOB CGC INPUT TEST | **JDC** 12210 **REV.** E **PAGE** 1 **OF** 3
INITIAL TDRR 29882 **D.S. PGS** 1

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
Ⓜ A	6-6-67	33906	2	-	EA	-
Ⓜ B	6-30-67	34070	All	All	EA	-
Ⓜ C	7-27-67	34246	3	-	EA	-
Ⓜ D	8-10-67	34342	1	-	EA	-
E	10-20-67	34897	2, 3	All	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

1. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

CH30-14/INO-14 through CH30-1/INO-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC INPUT TEST | **JDC** 12210 **REV** E **PAGE** 2 **OF** 3

SUBSYSTEM G & N SYSTEM | **ASSY**

7. Perform the following DSKY operations:

a. NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

Attitude Impulse Hand Control Position	DSKY Indication
a. Up	77775
b. Down	77776
c. Left	77737
d. Right	77757
e. Clockwise	77773
f. Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

UPLINK TEST

NOTE: Perform step 14 if ECP 518 has been incorporated; otherwise proceed to step 15.

14. Press and hold STBY pushbutton on DSKY. Observe Row 1 indicates 57777. Release STBY pushbutton.

15. Set Power switch on Tape Reader panel to ON.

16. Set Power switch on Tape Perforator panel to ON.

17. Press TAPE PREPARE and TAPE FREE RUN pushbuttons on Programmer and Monitor panel. TAPE PREPARE and TAPE FREE RUN indicators shall light.

18. Press TAPE READER, NEGATIVE, and POSITIVE pushbuttons on XY Interface panel. TAPE READER, NEGATIVE, and POSITIVE indicators shall light.

19. Set NISQ switch on Logic Drawer No. 2 panel to ON. Observe RESTART indicator on DSKY is lighted.

20. Using the "0" and "1" keys on the Octal Keyboard of the Programmer and Monitor panel, make a tape by punching the following from left to right. This tape should be prepared very carefully to insure a successful test:

100010111010001

21. Press STOP CODE pushbutton on Programmer and Monitor panel.

22. Set Power switch on Tape Perforator panel to OFF.

DATE 30 JUN 66

JOB CGC INPUT TEST | **JDC** 12210 **REV** E **PAGE** 3 **OF** 3

SUBSYSTEM G & N SYSTEM | **ASSY**

23. Install tape in Tape Reader panel.

24. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

25. Press AGC INPUT-CTR pushbutton on Programmer and Monitor panel. AGC INPUT-CTR indicator shall light.

26. Press CH33-10 pushbutton on RDC Interface panel. CH33-10 indicator shall light.

27. Set NISQ switch on Logic Drawer No. 2 panel to OFF, then sequentially press PROCEED (first), then ALARM RESET pushbuttons on Programmer and Monitor Panel.

28. Press RESET pushbutton on DSKY. The RESTART indicator shall go out.

29. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

30. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

31. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, perform following DSKY operations:

a. VERB 01 NOUN 01 ENTR
b. 00045 ENTR

Row 1 shall indicate 42721.

32. Set CONTINUITY TEST switch on Test Selector panel to 9. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291.

33. Press CONTINUITY TEST pushbutton on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

34. Press the CONTINUITY TEST pushbutton. The pushbutton shall go out.

35. Turn off all switches set to on in steps 15 through 31.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

JDC
NO. 12210
REV. E
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ **DWG** ______ **REV.** ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ **SER. NO.** ______ CAL DATE

NAME ______ **SER. NO.** ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION **APPROVED BY** ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 17, 18, 19, 25, 26, 31, 33, 34, and 35	Displays (Reacted as specified)						

DATE 30 JUN 66

JOB CGC INPUT TEST

JDC 12210 REV. F PAGE 1 OF 5

INITIAL TDRR 29882 D.S. PGS. 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		
			JDC	D.S.	MIT	NASA	REFERENCES
A	6-6-67	33906	2	-	EA	-	
B	6-30-67	34070	All	All	EA	-	
C	7-27-67	34246	3	-	EA	-	IMPORTANT See below
D	8-10-67	34342	1	-	EA	-	
E	10-20-67	34897	2, 3	All	EA	-	
F	1-4-68	35372	2,3	-	EA	-	INTERVAL
							TOOLS AND MATERIAL

IMPORTANT: Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

1. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

CH30-14/IN0-14 through CH30-1/IN0-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:
a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

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7. Perform the following DSKY operations:
a. NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:
a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

Attitude Impulse Hand Control Position	DSKY Indication
a. Up	77775
b. Down	77776
c. Left	77737
d. Right	77757
e. Clockwise	77773
f. Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

NOTE: Perform step 14 if ECP 518 has been incorporated; otherwise proceed to step 15.

14. Press and hold STBY pushbutton on DSKY. Observe Row 1 indicates 57777. Release STBY pushbutton.

UPLINK TEST

NOTE: 1. Ignore any computer alarms which may occur when Tape Reader or Tape Perforator power is applied or removed.
2. If Uplink Test fails prior to performance of step 39, perform steps 36 and 37, remove tape from Tape Reader, and perform Alternate Uplink Test (steps 44 through 66).

15. Set Power switch on Tape Perforator to ON. (Insure LOW TAPE lamp is not lighted.)

16. Insure TEST MODE switch on Programmer and Monitor panel is set to SUB SYSTEM.

17. Press to light TAPE PREPARE pushbutton on Programmer and Monitor panel.

18. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to ON. COUNTER STOP T12 and STPIT indicators shall light.

NOTE: Perform step 19 with extreme care to insure a successful test.

19. Using the 0 and 1 keys on the Programmer and Monitor panel keyboard, punch a tape identical to the 0 and 1 groups listed in rows a through v of Table 1 (reading from left to right). Press CL key before beginning and press SP key four or five times after each row is punched to provide spacing between rows.

a. 1 10001 01110 10001
b. 1 00010 11101 00010
c. 1 00001 11110 00001
d. 1 11111 00000 11111
e. 1 10000 01111 10000
f. 1 00010 11101 00010
g. 1 11100 00011 11100
h. 1 00001 11110 00001
i. 1 00010 11101 00010
j. 1 00011 11100 00011
k. 1 00100 11011 00100
l. 1 00101 11010 00101
m. 1 11100 00011 11100
n. 1 11010 00101 11010
Press STOP CODE key
o. 1 11110 00001 11110
p. 1 11011 00100 11011
q. 1 10000 01111 10000
r. 1 00110 11001 00110
s. 1 00111 11000 00111
t. 1 01000 10111 01000
u. 1 01001 10110 01001
v. 1 11100 00011 11100
Press STOP CODE key

Table 1

20. Press BUZZ pushbutton on Tape Perforator and remove tape.

21. Set Power switch on Tape Perforator to OFF.

22. Install tape in Tape Reader and set Tape Reader Power switch to ON.

23. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

24. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

25. Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

26. Press to light CH33-10 pushbutton on RDC Interface panel.

27. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to OFF.

28. Sequentially press PROCEED (first) then ALARM RESET pushbuttons on the Programmer and Monitor panel. Press RSET pushbutton on DSKY.

29. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

30. Perform the following DSKY operations:
a. VERB 36 ENTR

31. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe UPLINK ACTY indicator on the DSKY is lighted.

32. When the tape stops, observe the DSKY indicates the following:
a. VERB 21 NOUN 02
b. Row 1 indicates +
c. Row 3 indicates 12345

---

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

34. Observe the DSKY indicates the following:
a. VERB 21 NOUN 02
b. Row 1 indicates -06789
c. Row 3 indicates 12345

35. Perform the following DSKY operations:
a. VERB 36 ENTR
b. VERB 06 NOUN 02 ENTR
c. 12345 ENTR
d. Observe
Row 1 indicates -06789

NOTE: Reset all computer alarms which occur during performance of steps 36 through 38.

36. Press TAPE FREE RUN and MONITOR pushbuttons on Programmer and Monitor panel. TAPE FREE RUN and AGC INPUT-CTR pushbuttons shall go out and MONITOR pushbutton shall light.

37. Press to extinguish TAPE READER, NEGATIVE and POSITIVE pushbuttons on the XY Interface panel. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

38. Set Tape Reader Power switch to OFF.

39. Perform the following DSKY operations:
a. VERB 36 ENTR

40. Set CONTINUITY TEST switch on Test Selector panel to 9.

41. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291.

42. Press CONTINUITY TEST pushbuttons on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

43. Press the CONTINUITY TEST pushbutton. CONTINUITY TEST indicator shall go out.

ALTERNATE UPLINK TEST

44. Set Power switch on Tape Perforator to ON. (Insure LOW TAPE lamp is not lighted.)

45. Press to light TAPE PREPARE and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

46. Insure TEST MODE switch on Programmer and Monitor panel is at SUB SYSTEM.

47. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to ON.

NOTE: Perform step 48 with extreme care to insure a successful test.

48. Using the 0 and 1 keys on the Programmer and Monitor panel keyboard, make a tape by punching the following from left to right:

Press CL key 10001 01110 10001

49. Press STOP CODE key on Programmer and Monitor panel.

50. Press BUZZ pushbutton on Tape Perforator and remove tape.

51. Set Power switch on Tape Perforator to OFF.

52. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to OFF.

JOB CGC INPUT TEST | JDC 12210 REV F PAGE 5 OF 5

SUBSYSTEM G & N SYSTEM | ASSY

53. Press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel. Press RSET pushbutton on DSKY.

54. Install tape in Tape Reader.

55. Set Power switch on Tape Reader to ON.

56. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

57. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

58. Press to light AGC INPUT-CTR pushbutton on Programmer and Monitor panel. Insure CH33-10 pushbutton on RDC Interface panel is lighted.

59. Perform the following DSKY operations:

a. VERB 36 ENTR

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

61. When tape stops perform the following DSKY operations:

a. VERB 11 NOUN 01 ENTR

b. 00045 ENTR

c. Observe

Row 1 indicates 42721

62. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel.

63. Set Power switch on Tape Reader to OFF.

64. Press to extinguish TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel. Each specified pushbutton shall go out.

65. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light and AGC INPUT-CTR pushbutton shall go out.

66. Repeat steps 39 through 43.

DATE 30 JUN 6

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12210
REV. F
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ________ DWG ________ REV. ________

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE

NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX-VALUE	REJ	ACC
1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 17, 18, 19, 25, 26, 31, 33, 34, and 35	Displays (Reacted as specified)						

DATE 30 JUN 66

JOB CGC INPUT TEST	JDC 12210 REV. G PAGE 1 OF 5 INITIAL TDRR 29882 D.S. PGS 1
SUBSYSTEM G & N SYSTEM	ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	6-6-67	33906	2	-	EA	-	
B	6-30-67	34070	All	All	EA	-	
C	7-27-67	34246	3	-	EA	-	IMPORTANT See below
D	8-10-67	34342	1	-	EA	-	
E	10-20-67	34897	2, 3	All	EA	-	
F	1-4-68	35372	2, 3	-	EA	-	INTERVAL
G	3-19-68	35890	2-5	All	EA	-	
							TOOLS AND MATERIAL

IMPORTANT: Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

1. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

CH30-14/INO-14 through CH30-1/INO-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC INPUT TEST	JDC 12210 REV G PAGE 2 OF 5
SUBSYSTEM G & N SYSTEM	ASSY

7. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

Attitude Impulse Hand Control Position	DSKY Indication
a. Up	77775
b. Down	77776
c. Left	77737
d. Right	77757
e. Clockwise	77773
f. Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

NOTE: Perform step 14 if ECP 518 has been incorporated; otherwise proceed to step 15.

14. Press and hold PRO (or STBY) pushbutton on DSKY. Observe Row 1 indicates 57777. Release PRO (or STBY) pushbutton.

UPLINK TEST

NOTE: 1. Ignore any computer alarms which may occur when Tape Reader or Tape Perforator power is applied or removed.
2. If Uplink Test fails prior to performance of step 39, perform steps 36 and 37, remove tape from Tape Reader, and perform Alternate Uplink Test (steps 44 through 66).

15. Set Power switch on Tape Perforator to ON. (Insure LOW TAPE lamp is not lighted.)

16. Insure TEST MODE switch on Programmer and Monitor panel is set to SUB SYSTEM.

17. Press to light TAPE PREPARE pushbutton on Programmer and Monitor panel.

18. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to ON. COUNTER STOP T12 and STPIT indicators shall light. The RESTART lamp on the DSKY and the CMC and PGNS lamps on the Indicator Control panel may light.

DATE 30 JUN 66

JOB CGC INPUT TEST	JDC 12210 REV G PAGE 3 OF 5
SUBSYSTEM G & N SYSTEM	ASSY

NOTE: Perform step 19 with extreme care to insure a successful test.

19. Using the 0 and 1 keys on the Programmer and Monitor panel keyboard, punch a tape identical to the 0 and 1 groups listed in rows a through v of Table 1 (reading from left to right). Press CL key before beginning and press SP key four or five times after each row is punched to provide spacing between rows.

a. 1 10001 01110 10001
b. 1 00010 11101 00010
c. 1 00001 11110 00001
d. 1 11111 00000 11111
e. 1 10000 01111 10000
f. 1 00010 11101 00010
g. 1 11100 00011 11100
h. 1 00001 11110 00001
i. 1 00010 11101 00010
j. 1 00011 11100 00011
k. 1 00100 11011 00100
l. 1 00101 11010 00101
m. 1 11100 00011 11100
n. 1 11010 00101 11010
Press STOP CODE key
o. 1 11110 00001 11110
p. 1 11011 00100 11011
q. 1 10000 01111 10000
r. 1 00110 11001 00110
s. 1 00111 11000 00111
t. 1 01000 10111 01000
u. 1 01001 10110 01001
v. 1 11100 00011 11100
Press STOP CODE key

Table 1

20. Press BUZZ pushbutton on Tape Perforator and remove tape.

21. Set Power switch on Tape Perforator to OFF.

22. Install tape in Tape Reader and set Tape Reader Power switch to ON.

23. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

24. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

25. Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

26. Press to light CH33-10 pushbutton on RDC Interface panel.

27. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to OFF. COUNTER STOP T12 and STPIT lamps shall extinguish.

28. Sequentially press PROCEED (first) then ALARM RESET pushbuttons on the Programmer and Monitor panel. Press RSET pushbutton on DSKY.

29. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

30. Perform the following DSKY operations:

a. VERB 36 ENTR

31. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe UPLINK ACTY indicator on the DSKY is lighted.

32. When the tape stops, observe the DSKY indicates the following:

a. VERB 21 NOUN 02

DATE 30 JUN 66

JOB CGC INPUT TEST	JDC 12210 REV G PAGE 4 OF 5
SUBSYSTEM G & N SYSTEM	ASSY

b. Row 1 indicates +
c. Row 3 indicates 12345

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

34. Observe the DSKY indicates the following:

a. VERB 21 NOUN 02
b. Row 1 indicates -06789
c. Row 3 indicates 12345

35. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 06 NOUN 02 ENTR
c. 12345 ENTR
d. Observe
Row 1 indicates -06789

NOTE: Reset all computer alarms which occur during performance of steps 36 through 38.

36. Press TAPE FREE RUN and MONITOR pushbuttons on Programmer and Monitor panel. TAPE FREE RUN and AGC INPUT-CTR pushbuttons shall go out and MONITOR pushbutton shall light.

37. Press to extinguish TAPE READER, NEGATIVE and POSITIVE pushbuttons on the XY Interface panel. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

38. Set Tape Reader Power switch to OFF.

39. Perform the following DSKY operations:

a. VERB 36 ENTR
b. Press RSET
c. Press ALARM RESET on Programmer and Monitor panel

40. Set CONTINUITY TEST switch on Test Selector panel to 9.

41. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291.

42. Press CONTINUITY TEST pushbuttons on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

43. Press the CONTINUITY TEST pushbutton. CONTINUITY TEST indicator shall go out.

ALTERNATE UPLINK TEST

44. Set Power switch on Tape Perforator to ON. (Insure LOW TAPE lamp is not lighted.)

45. Press to light TAPE PREPARE and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

46. Insure TEST MODE switch on Programmer and Monitor panel is at SUB SYSTEM.

47. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to ON. COUNTER STOP T12 and STPIT lamps shall light.

NOTE: Perform step 48 with extreme care to insure a successful test.

48. Using the 0 and 1 keys on the Programmer and Monitor panel keyboard, make a tape by punching the following from left to right:

Press CL key 10001 01110 10001

49. Press STOP CODE key on Programmer and Monitor panel.

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50. Press BUZZ pushbutton on Tape Perforator and remove tape.

51. Set Power switch on Tape Perforator to OFF.

52. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to OFF. COUNTER STOP T12 and STPIT lamps shall extinguish.

53. Press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel. Press RSET pushbutton on DSKY.

54. Install tape in Tape Reader.

55. Set Power switch on Tape Reader to ON.

56. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

57. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

58. Press to light AGC INPUT-CTR pushbutton on Programmer and Monitor panel. Insure CH33-10 pushbutton on RDC Interface panel is lighted.

59. Perform the following DSKY operations:

a. VERB 36 ENTR

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

61. When tape stops perform the following DSKY operations:

a. VERB 11 NOUN 01 ENTR
b. 00045 ENTR
c. Observe
Row 1 indicates 42721

62. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel.

63. Set Power switch on Tape Reader to OFF.

64. Press to extinguish TAPE READER NEGATIVE and POSITIVE pushbuttons on XY Interface panel. Press CH33-10 on RDC Interface panel. Each specified pushbutton shall go out.

65. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light and AGC INPUT - CTR pushbutton shall go out.

66. Repeat steps 39 through 43.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12210
REV. G
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 17, 18, 25, 26, 31, 32, 34, 35, 36, 37, 42, 43, 44, 45, 47, 52, 56, 58, 61, 62, 64, and 65	Displays (Reacted as specified)						

DATE 30 JUN 66

JOB CGC INPUT TEST

JDC 12210 REV. H PAGE 1 OF 5

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	6-6-67	33906	2	-	EA	-
B	6-30-67	34070	All	All	EA	-
C	7-27-67	34246	3	-	EA	-
D	8-10-67	34342	1	-	EA	-
E	10-20-67	34897	2, 3	All	EA	-
F	1-4-68	35372	2,3	-	EA	-
G	3-19-68	35890	2-5	All	EA	-
H	4-26-68	36145	1,3	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

NOTE: If the VERB display on DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

1. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

CH30-14/INO-14 through CH30-1/INO-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB CGC INPUT TEST

JDC 12210 REV H PAGE 2 OF 5

SUBSYSTEM G & N SYSTEM

ASSY

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

7. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

	Attitude Impulse Hand Control Position	DSKY Indication
a.	Up	77775
b.	Down	77776
c.	Left	77737
d.	Right	77757
e.	Clockwise	77773
f.	Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

NOTE: Perform step 14 if ECP 518 has been incorporated; otherwise proceed to step 15.

14. Press and hold PRO (or STBY) pushbutton on DSKY. Observe Row 1 indicates 57777. Release PRO (or STBY) pushbutton.

UPLINK TEST

NOTE: 1. Ignore any computer alarms which may occur when Tape Reader or Tape Perforator power is applied or removed.

2. If Uplink Test fails prior to performance of step 39, perform steps 36 and 37, remove tape from Tape Reader, and perform Alternate Uplink Test (steps 44 through 66).

15. Set Power switch on Tape Perforator to ON. (Insure LOW TAPE lamp is not lighted.)

16. Insure TEST MODE switch on Programmer and Monitor panel is set to SUB SYSTEM.

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JOB CGC INPUT TEST

JDC 12210 REV H PAGE 3 OF 5

SUBSYSTEM G & N SYSTEM

ASSY

17. Press to light TAPE PREPARE pushbutton on Programmer and Monitor panel.

18. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to ON. COUNTER STOP T12 and STPIT indicators shall light. The RESTART lamp on the DSKY and the CMC and PGNS lamps on the Indicator Control panel may light.

NOTE: Perform step 19 with extreme care to insure a successful test.

19. Using the 0 and 1 keys on the Programmer and Monitor panel keyboard, punch a tape identical to the 0 and 1 groups listed in rows a through v of Table 1 (reading from left to right). Press CL key before beginning and press SP key four or five times after each row is punched to provide spacing between rows.

a. 1 10001 01110 10001
b. 1 00010 11101 00010
c. 1 00001 11110 00001
d. 1 11111 00000 11111
e. 1 10000 01111 10000
f. 1 00010 11101 00010
g. 1 11100 00011 11100
h. 1 00001 11110 00001
i. 1 00010 11101 00010
j. 1 00011 11100 00011
k. 1 00100 11011 00100
l. 1 00101 11010 00101
m. 1 11100 00011 11100
n. 1 11010 00101 11010

Table 1

Press STOP CODE key

o. 1 11110 00001 11110
p. 1 11011 00100 11011
q. 1 10000 01111 10000
r. 1 00110 11001 00110
s. 1 00111 11000 00111
t. 1 01000 10111 01000
u. 1 01001 10110 01001
v. 1 11100 00011 11100

Press STOP CODE key

Table 1 (cont)

20. Press BUZZ pushbutton on Tape Perforator and remove tape.

21. Set Power switch on Tape Perforator to OFF.

22. Install tape in Tape Reader and set Tape Reader Power switch to ON.

23. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

24. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

25. Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

26. Press to light CH33-10 pushbutton on RDC Interface panel.

27. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to OFF. COUNTER STOP T12 lamp shall extinguish.

28. Sequentially press PROCEED (first) then ALARM RESET pushbuttons on Programmer and Monitor panel. Press RSET pushbutton on DSKY. STPIT lamp on Logic Drawer No. 2 shall extinguish.

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JOB CGC INPUT TEST

JDC 12210 REV H PAGE 4 OF 5

SUBSYSTEM G & N SYSTEM

ASSY

29. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

30. Perform the following DSKY operations:

a. VERB 36 ENTR

31. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe UPLINK ACTY indicator on the DSKY is lighted.

32. When the tape stops, observe the DSKY indicates the following:

a. VERB 21 NOUN 02
b. Row 1 indicates +
c. Row 3 indicates 12345

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

34. Observe the DSKY indicates the following:

a. VERB 21 NOUN 02
b. Row 1 indicates -06789
c. Row 3 indicates 12345

35. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 06 NOUN 02 ENTR
c. 12345 ENTR
d. Observe
Row 1 indicates -06789

NOTE: Reset all computer alarms which occur during performance of steps 36 through 38.

36. Press TAPE FREE RUN and MONITOR pushbuttons on Programmer and Monitor panel. TAPE FREE RUN and AGC INPUT-CTR pushbuttons shall go out and MONITOR pushbutton shall light.

37. Press to extinguish TAPE READER, NEGATIVE and POSITIVE pushbuttons on the XY Interface panel. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

38. Set Tape Reader Power switch to OFF.

39. Perform the following DSKY operations:

a. VERB 36 ENTR
b. Press RSET
c. Press ALARM RESET on Programmer and Monitor panel

40. Set CONTINUITY TEST switch on Test Selector panel to 9.

41. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291.

42. Press CONTINUITY TEST pushbuttons on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

43. Press the CONTINUITY TEST pushbutton. CONTINUITY TEST indicator shall go out.

ALTERNATE UPLINK TEST

44. Set Power switch on Tape Perforator to ON. (Insure LOW TAPE lamp is not lighted.)

45. Press to light TAPE PREPARE and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

46. Insure TEST MODE switch on Programmer and Monitor panel is at SUB SYSTEM.

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47. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to ON. COUNTER STOP T12 and STPIT lamps shall light.

NOTE: Perform step 48 with extreme care to insure a successful test.

48. Using the 0 and 1 keys on the Programmer and Monitor panel keyboard, make a tape by punching the following from left to right:

Press CL key 10001 01110 10001

49. Press STOP CODE key on Programmer and Monitor panel.

50. Press BUZZ pushbutton on Tape Perforator and remove tape.

51. Set Power switch on Tape Perforator to OFF.

52. Set COUNTER STOP T12 switch on Logic Drawer No. 2 to OFF. COUNTER STOP T12 and STPIT lamps shall extinguish.

53. Press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel. Press RSET pushbutton on DSKY.

54. Install tape in Tape Reader.

55. Set Power switch on Tape Reader to ON.

56. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

57. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

58. Press to light AGC INPUT-CTR pushbutton on Programmer and Monitor panel. Insure CH33-10 pushbutton on RDC Interface panel is lighted.

59. Perform the following DSKY operations:

a. VERB 36 ENTR

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

61. When tape stops perform the following DSKY operations:

a. VERB 11 NOUN 01 ENTR
b. 00045 ENTR
c. Observe
Row 1 indicates 42721

62. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel.

63. Set Power switch on Tape Reader to OFF.

64. Press to extinguish TAPE READER NEGATIVE and POSITIVE pushbuttons on XY Interface panel. Press CH33-10 on RDC Interface panel. Each specified pushbutton shall go out.

65. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light and AGC INPUT - CTR pushbutton shall go out.

66. Repeat steps 39 through 43.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12210
REV. H
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 17, 18, 25, 26, 31, 32, 34, 35, 36, 37, 42, 43, 44, 45, 47, 52, 56, 58, 61, 62, 64, and 65	Displays (Reacted as specified)						

JOB CGC INPUT TEST

JDC 12210 REV. J PAGE 1 OF 4

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	6-6-67	33906	2	-	EA	-
B	6-30-67	34070	All	All	EA	-
C	7-27-67	34246	3	-	EA	-
D	8-10-67	34342	1	-	EA	-
E	10-20-67	34897	2, 3	All	EA	-
F	1-4-68	35372	2,3	-	EA	-
G	3-19-68	35890	2-5	All	EA	-
H	4-26-68	36145	1,3	-	EA	-
J	3-11-69	37403	All	All	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL UPLINK Test Tape, P/N 2901676-001

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) is connected to the CGC test connector before proceeding with this JDC.

NOTE: If the VERB display on DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

NOTE: Insure that jumpers are connected from CLOCK connector on the CTS Interface Signals patch board to the CLOCK connector on the Frequency Counter and from the EXT SY-2 connector on the XY Interface panel to the Oscilloscope CLOCK connector on the patch board.

1. Connect Self Test Assembly, 201439[illegible], to Buffer Box Assembly by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10. Press to light SELF TEST pushbutton on Self Test panel and set digiswitches on Self Test panel and Self Test Assembly to 00000.

1A. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FCR 4011A
Chg. 3-8-68

JOB CGC INPUT TEST

JDC 12210 REV J PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

CH30-14/IN0-14 through CH30-1/IN0-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:
a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

7. Perform the following DSKY operations:
a. VERB 11 NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:
a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

Attitude Impulse Hand Control Position	DSKY Indication
a. Up	77775
b. Down	77776
c. Left	77737
d. Right	77757
e. Clockwise	77773
f. Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

DATE 30 JUN 66

JOB CGC INPUT TEST

JDC 12210 REV J PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Perform step 14 if ECP 518 has been incorporated; otherwise proceed to step 15.

14. Press and hold PRO (or STBY) pushbutton on DSKY. Observe Row 1 indicates 57777. Release PRO (or STBY) pushbutton.

UPLINK TEST

15. Install tape in Tape Reader and set Tape Reader Power switch to ON.

16. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

17. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

18. Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

19. Press to light CH33-10 pushbutton on RDC Interface panel.

20. Press EXECUTE pushbutton on Programmer and Monitor panel. Insure that tape advances to first UPLINK code. Press EXECUTE pushbutton again.

21. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

22. Perform the following DSKY operations:
a. VERB 36 ENTR

23. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe UPLINK ACTY indicator on the DSKY is lighted.

24. When the tape stops, observe the DSKY indicates the following:
a. VERB 21 NOUN 02
b. Row 1 indicates +
c. Row 3 indicates 12345

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

26. Observe the DSKY indicates the following:
a. VERB 21 NOUN 02
b. Row 1 indicates -06789
c. Row 3 indicates 12345

27. Perform the following DSKY operations:
a. VERB 36 ENTR
b. VERB 06 NOUN 02 ENTR
c. 12345 ENTR
d. Observe
Row 1 indicates -06789

28. Press TAPE FREE RUN and MONITOR pushbuttons on Programmer and Monitor panel. TAPE FREE RUN and AGC INPUT-CTR pushbuttons shall go out and MONITOR pushbutton shall light.

29. Press to extinguish TAPE READER, NEGATIVE and POSITIVE pushbuttons on the XY Interface panel. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

30. Press to extinguish SELF TEST pushbutton on Self Test panel. Rewind and remove tape from Tape Reader and set Power switch to OFF.

31. Perform the following DSKY operations:
a. VERB 36 ENTR
b. Press RSET

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JOB CGC INPUT TEST

JDC 12210 REV J PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

32. Set CONTINUITY TEST switch on Test Selector panel to 9.

33. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291 to monitor the Continuity Test on the DVM.

34. Press CONTINUITY TEST pushbuttons on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

35. Press the CONTINUITY TEST pushbutton. CONTINUITY TEST indicator shall go out.

36. Remove Self Test Assembly from Buffer Box Assembly.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

NO. 12210 JDC
REV. J
INITIAL TDRR 9882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE

NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1A, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 16 18, 19, 20, 23, 24, 26, 27, 28, 29, 30, 34 and 35	Displays (Reacted as specified)						

DATE 30 JUN 66

JOB CGC INPUT TEST	JDC 12210 REV. K PAGE 1 OF 4 INITIAL TDRR 29882 D.S. PGS 1
SUBSYSTEM G & N SYSTEM	ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	6-6-67	33906	2	-	EA	-
B	6-30-67	34070	All	All	EA	-
C	7-27-67	34246	3	-	EA	-
D	8-10-67	34342	1	-	EA	-
E	10-20-67	34897	2, 3	All	EA	-
F	1-4-68	35372	2,3	-	EA	-
G	3-19-68	35890	2-5	All	EA	-
H	4-26-68	36145	1,3	-	EA	-
J	3-11-69	37403	All	All	EA	-
K	4-14-69	37496	3	-	EA	-

REFERENCES	
IMPORTANT	See below
INTERVAL	
TOOLS AND MATERIAL	UPLINK Test Tape, P/N 2901676-001

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) is connected to the CGC test connector before proceeding with this JDC.

NOTE: If the VERB display on DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

NOTE: Insure that jumpers are connected from CLOCK connector on the CTS Interface Signals patch board to the CLOCK connector on the Frequency Counter and from the EXT SY-2 connector on the XY Interface panel to the Oscilloscope CLOCK connector on the patch board.

1. Connect Self Test Assembly, 2014392, to Buffer Box Assembly by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10. Press to light SELF TEST pushbutton on Self Test panel and set digiswitches on Self Test panel and Self Test Assembly to 00000.

1A. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

CH30-14/IN0-14 through CH30-1/IN0-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:
   - a. VERB 11 NOUN 10 ENTR
   - b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

7. Perform the following DSKY operations:
   - a. VERB 11 NOUN 10 ENTR
   - b. 00031 ENTR

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:
    - a. VERB 11 NOUN 10 ENTR
    - b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

Attitude Impulse Hand Control Position	DSKY Indication
a. Up	77775
b. Down	77776
c. Left	77737
d. Right	77757
e. Clockwise	77773
f. Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

NOTE: Perform step 14 if ECP 518 has been incorporated; otherwise proceed to step 15.

14. Press and hold PRO (or STBY) pushbutton on DSKY. Observe Row 1 indicates 57777. Release PRO (or STBY) pushbutton.

UPLINK TEST

15. Install tape in Tape Reader and set Tape Reader Power switch to ON.

16. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

17. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

18. Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

19. Press to light CH33-10 pushbutton on RDC Interface panel.

20. Press EXECUTE pushbutton on Programmer and Monitor panel. Insure that tape advances to first UPLINK code. Press EXECUTE pushbutton again.

21. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

22. Perform the following DSKY operations:
    - a. VERB 36 ENTR

23. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe UPLINK ACTY indicator on the DSKY is lighted.

24. When the tape stops, observe the DSKY indicates the following:
    - a. VERB 21 NOUN 02 Flashing
    - b. Row 1 indicates +
    - c. Row 3 indicates 12345

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

26. Observe the DSKY indicates the following:
    - a. VERB 21 NOUN 02 Flashing
    - b. Row 1 indicates -06789
    - c. Row 3 indicates 12345

NOTE: If DSKY entries are being recorded on the CTS Tape Perforator, press to light RECORD pushbutton on Programmer and Monitor panel prior to performance of step 27.

27. Perform the following DSKY operations:
    - a. VERB 36 ENTR
    - b. VERB 06 NOUN 02 ENTR
    - c. 12345 ENTR
    - d. Observe
      Row 1 indicates -06789

28. Press TAPE FREE RUN and MONITOR pushbuttons on Programmer and Monitor panel. TAPE FREE RUN and AGC INPUT-CTR pushbuttons shall go out and MONITOR pushbutton shall light.

---

29. Press to extinguish TAPE READER, NEGATIVE and POSITIVE pushbuttons on the XY Interface panel. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

30. Press to extinguish SELF TEST pushbutton on Self Test panel. Rewind and remove tape from Tape Reader and set Power switch to OFF.

31. Perform the following DSKY operations:
    - a. VERB 36 ENTR
    - b. Press RSET

32. Set CONTINUITY TEST switch on Test Selector panel to 9.

33. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291 to monitor the Continuity Test on the DVM.

34. Press CONTINUITY TEST pushbuttons on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

35. Press the CONTINUITY TEST pushbutton. CONTINUITY TEST indicator shall go out.

36. Remove Self Test Assembly from Buffer Box Assembly.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12210
REV. K
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE

NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1A, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 16 18, 19, 20, 23, 24, 26, 27, 28, 29, 30, 34 and 35	Displays (Reacted as specified)						

DATE 30 JUN 66

JDC 12210 REV. L PAGE 1 OF 4
INITIAL TDRR 29882 D.S. PGS 1

JOB CGC INPUT TEST

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	6-6-67	33906	2	-	EA	-
B	6-30-67	34070	All	All	EA	-
C	7-27-67	34246	3	-	EA	-
D	8-10-67	34342	1	-	EA	-
E	10-20-67	34897	2, 3	All	EA	-
F	1-4-68	35372	2, 3	-	EA	-
G	3-19-68	35890	2-5	All	EA	-
H	4-26-68	36145	1, 3	-	EA	-
J	3-11-69	37403	All	All	EA	-
K	4-14-69	37496	3	-	EA	-
L	10-20-69	37876	3	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL UPLINK Test Tape, P/N 2901676-001

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) is connected to the CGC test connector before proceeding with this JDC.

NOTE: If the VERB display on DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

NOTE: Insure that jumpers are connected from CLOCK connector on the CTS Interface Signals patch board to the CLOCK connector on the Frequency Counter and from the EXT SY-2 connector on the XY Interface panel to the Oscilloscope CLOCK connector on the patch board.

1. Connect Self Test Assembly, 2014392, to Buffer Box Assembly by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10. Press to light SELF TEST pushbutton on Self Test panel and set digiswitches on Self Test panel and Self Test Assembly to 00000.

1A. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM C1143A
Chg. 1-8-6

JOB CGC INPUT TEST

JDC 12210 REV L PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

CH30-14/IN0-14 through CH30-1/IN0-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

7. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

Attitude Impulse Hand Control Position	DSKY Indication
a. Up	77775
b. Down	77776
c. Left	77737
d. Right	77757
e. Clockwise	77773
f. Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

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JOB CGC INPUT TEST

JDC 12210 REV L PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Perform step 14 if ECP 518 has been incorporated; otherwise proceed to step 15.

14. Press and hold PRO (or STBY) pushbutton on DSKY. Observe Row 1 indicates 57777. Release PRO (or STBY) pushbutton.

UPLINK TEST

15. Install tape in Tape Reader and set Tape Reader Power switch to ON.

16. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

17. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

18. Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

19. Press to light CH33-10 pushbutton on RDC Interface panel.

20. Press EXECUTE pushbutton on Programmer and Monitor panel. Insure that tape advances to first UPLINK code. Press EXECUTE pushbutton again.

21. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

22. Perform the following DSKY operations:

a. VERB 36 ENTR

23. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe UPLINK ACTY indicator on the DSKY is lighted.

24. When the tape stops, observe the DSKY indicates the following:

a. VERB 21 NOUN 02 Flashing
b. Row 1 indicates +
c. Row 3 indicates 12345

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

26. Observe the DSKY indicates the following:

a. VERB 21 NOUN 02
b. Row 1 indicates -06789
c. Row 3 indicates 12345

NOTE: If DSKY entries are being recorded on the CTS Tape Perforator, press to light RECORD pushbutton on Programmer and Monitor panel prior to performance of step 27.

27. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 06 NOUN 02 ENTR
c. 12345 ENTR
d. Observe
Row 1 indicates -06789

28. Press TAPE FREE RUN and MONITOR pushbuttons on Programmer and Monitor panel. TAPE FREE RUN and AGC INPUT-CTR pushbuttons shall go out and MONITOR pushbutton shall light.

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JOB CGC INPUT TEST

JDC 12210 REV L PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

29. Press to extinguish TAPE READER, NEGATIVE and POSITIVE pushbuttons on the XY Interface panel. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

30. Press to extinguish SELF TEST pushbutton on Self Test panel. Rewind and remove tape from Tape Reader and set Power switch to OFF.

31. Perform the following DSKY operations:

a. VERB 36 ENTR
b. Press RSET

32. Set CONTINUITY TEST switch on Test Selector panel to 9.

33. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291 to monitor the Continuity Test on the DVM.

34. Press CONTINUITY TEST pushbuttons on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

35. Press the CONTINUITY TEST pushbutton. CONTINUITY TEST indicator shall go out.

36. Remove Self Test Assembly from Buffer Box Assembly.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 12210 JDC
REV. L
INITIAL TDRR 29832

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1A, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 16 18, 19, 20, 23, 24, 26, 27, 28, 29, 30, 34 and 35	Displays (Reacted as specified)						

DATE 30 JUN 66

JOB CGC INPUT TEST | JDC 12210 REV. M PAGE 1 OF 4

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	6-6-67	33906	2	-	EA	-
B	6-30-67	34070	All	All	EA	-
C	7-27-67	34246	3	-	EA	-
D	8-10-67	34342	1	-	EA	-
E	10-20-67	34897	2, 3	All	EA	-
F	1-4-68	35372	2, 3	-	EA	-
G	3-19-68	35890	2-5	All	EA	-
H	4-26-68	36145	1, 3	-	EA	-
J	3-11-69	37403	All	All	EA	-
K	4-14-69	37496	3	-	EA	-
L	10-20-69	37876	3	-	EA	-
M	5-26-70	38121	1, 4	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL UPLINK Test Tape, P/N 2901676-001

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) or Restart Monitor module (2898989) is connected to the CGC test connector before proceeding with this JDC.

NOTE: If the VERB display on DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

NOTE: Insure that jumpers are connected from CLOCK connector on the CTS Interface Signals patch board to the CLOCK connector on the Frequency Counter and from the EXT SY-2 connector on the XY Interface panel to the Oscilloscope CLOCK connector on the patch board.

1. Connect Self Test Assembly, 2014392, to Buffer Box Assembly by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10. Press to light SELF TEST pushbutton on Self Test panel and set digiswitches on Self Test panel and Self Test Assembly to 00000.

1A. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

NOTE: Step 1B applies only if Restart Monitor module (2898989) is installed.

1B. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on

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VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB CGC INPUT TEST | JDC 12210 REV M PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

RDC Interface panel are not lighted.

CH30-14/IN0-14 through CH30-1/IN0-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

7. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

Attitude Impulse Hand Control Position	DSKY Indication
a. Up	77775
b. Down	77776
c. Left	77737
d. Right	77757
e. Clockwise	77773
f. Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

NOTE: Perform step 14 if ECP 518 has been incorporated; otherwise proceed to step 15.

14. Press and hold PRO (or STBY) pushbutton on DSKY. Observe Row 1 indicates 57777. Release PRO (or STBY) pushbutton.

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JOB CGC INPUT TEST | JDC 12210 REV M PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

UPLINK TEST

15. Install tape in Tape Reader and set Tape Reader Power switch to ON.

16. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

17. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

18. Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

19. Press to light CH33-10 pushbutton on RDC Interface panel.

20. Press EXECUTE pushbutton on Programmer and Monitor panel. Insure that tape advances to first UPLINK code. Press EXECUTE pushbutton again.

21. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

22. Perform the following DSKY operations:

a. VERB 36 ENTR

23. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe UPLINK ACTY indicator on the DSKY is lighted.

24. When the tape stops, observe the DSKY indicates the following:

a. VERB 21 NOUN 02 Flashing
b. Row 1 indicates +
c. Row 3 indicates 12345

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

26. Observe the DSKY indicates the following:

a. VERB 21 NOUN 02
b. Row 1 indicates -06789
c. Row 3 indicates 12345

NOTE: If DSKY entries are being recorded on the CTS Tape Perforator, press to light RECORD pushbutton on Programmer and Monitor panel prior to performance of step 27.

27. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 06 NOUN 02 ENTR
c. 12345 ENTR
d. Observe

Row 1 indicates -06789

28. Press TAPE FREE RUN and MONITOR pushbuttons on Programmer and Monitor panel. TAPE FREE RUN and AGC INPUT-CTR pushbuttons shall go out and MONITOR pushbutton shall light.

29. Press to extinguish TAPE READER, NEGATIVE and POSITIVE pushbuttons on the XY Interface panel. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

30. Press to extinguish SELF TEST pushbutton on Self Test panel. Rewind and remove tape from Tape Reader and set Power switch to OFF.

31. Perform the following DSKY operations:

a. VERB 36 ENTR
b. Press RSET

DATE 30 JUN 66

JOB CGC INPUT TEST | JDC 12210 REV M PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM | ASSY

32. Set CONTINUITY TEST switch on Test Selector panel to 9.

33. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291 to monitor the Continuity Test on the DVM.

34. Press CONTINUITY TEST pushbuttons on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

35. Press the CONTINUITY TEST pushbutton. CONTINUITY TEST indicator shall go out.

36. Remove Self Test Assembly from Buffer Box Assembly.

NOTE: Step 37 applies only if Restart Monitor Module (2898989) is installed.

37. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

JDC
NO. 12210
REV. M
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ____________________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________________ SER. NO. ________ CAL DATE

NAME ____________________ SER. NO. ________ CAL DATE

CONDUCTED BY ____________________ NAME/AFFILIATION

APPROVED BY ____________________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1A, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 16 18, 19, 20, 23, 24, 26, 27, 28, 29, 30, 34 and 35	Displays (Reacted as specified)						

DATE 30 JUN 66

JOB CGC INPUT TEST

JDC 12210 REV. N PAGE 1 OF 4

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	6-6-67	33906	2	-	EA	-
B	6-30-67	34070	All	All	EA	-
C	7-27-67	34246	3	-	EA	-
D	8-10-67	34342	1	-	EA	-
E	10-20-67	34897	2, 3	All	EA	-
F	1-4-68	35372	2, 3	-	EA	-
G	3-19-68	35890	2-5	All	EA	-
H	4-26-68	36145	1, 3	-	EA	-
J	3-11-69	37403	All	All	EA	-
K	4-14-69	37496	3	-	EA	-
L	10-20-69	37876	3	-	EA	-
M	5-26-70	38121	1. 4	-	EA	-
N	12-6-71	38524	2, 3	-	EA	-

REFERENCES

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL UPLINK Test Tape, P/N 2901676-001

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) or Restart Monitor module (2898989) is connected to the CGC test connector before proceeding with this JDC.

NOTE: If the VERB display on DSKY contains a number from 11 through 17, the KEY REL indicator may flash when DSKY entries are made.

NOTE: Insure that jumpers are connected from CLOCK connector on the CTS Interface Signals patch board to the CLOCK connector on the Frequency Counter and from the EXT SY-2 connector on the XY Interface panel to the Oscilloscope CLOCK connector on the patch board.

1. Connect Self Test Assembly, 2014392, to Buffer Box Assembly by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10. Press to light SELF TEST pushbutton on Self Test panel and set digiswitches on Self Test panel and Self Test Assembly to 00000.

1A. Insure that the ISS is in the Standby condition and that the CGC/LGC POWER ON and 400 CPS POWER ON indicators on Test Control panel are lighted.

NOTE: Step 1B applies only if Restart Monitor module (2898989) is installed.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

1B. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR

2. Set DE MARGINS switch on RDC Interface panel to NORM.

3. Insure that following pushbuttons on RDC Interface panel are not lighted.

CH30-14/IN0-14 through CH30-1/IN0-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 37700.

6. Press CH30-6/IN0-6 through CH30-1/IN0-1 pushbuttons. Each pushbutton specified shall go out. Row 1 of the DSKY shall indicate 37777.

7. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons on RDC Interface panel. Each specified pushbutton shall light. Row 1 of the DSKY shall indicate 40000.

9. Press CH31-14/IN2-14 through CH31-1/IN2-1 pushbuttons. Each specified pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set Attitude Impulse Hand Controller on the Indicator Control panel to following positions and observe Row 1 of the DSKY for proper indications:

	Attitude Impulse Hand Control Position	DSKY Indication
a.	Up	77775
b.	Down	77776
c.	Left	77737
d.	Right	77757
e.	Clockwise	77773
f.	Counterclockwise	77767

12. Press CH32-11/IN3-11 pushbutton on RDC Interface panel. CH32-11/IN3-11 pushbutton shall light. Row 1 of the DSKY shall indicate 75777.

13. Press CH32-11/IN3-11 pushbutton. CH32-11/IN3-11 pushbutton shall go out. Row 1 of the DSKY shall indicate 77777.

13A. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00033 ENTR
c. Observe Row 1 indicates XXXX7.

13B. Press the CH33-2 pushbutton on the RDC Interface panel. The pushbutton shall light. Row 1 of the DSKY shall indicate XXXX5.

13C. Press the CH33-2 pushbutton. The pushbutton shall go out. Row 1 of the DSKY shall indicate XXXX7.

14. Press and hold PRO (or STBY) pushbutton on DSKY. Observe Row 1 indicates 57777. Release PRO (or STBY) pushbutton.

UPLINK TEST

15. Install tape in Tape Reader and set Tape Reader Power switch to ON.

16. Press to light TAPE READER, NEGATIVE and POSITIVE pushbuttons on XY Interface panel.

17. Set AGC INPUT COUNTERS switch on XY Interface panel to 9.

18. Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

19. Press to light CH33-10 pushbutton on RDC Interface panel.

20. Press EXECUTE pushbutton on Programmer and Monitor panel. Insure that tape advances to first UPLINK code. Press EXECUTE pushbutton again.

21. Set UP TELEMETRY switch on Indicator Control panel to ACCEPT.

22. Perform the following DSKY operations:

a. VERB 36 ENTR

23. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe UPLINK ACTY indicator on the DSKY is lighted.

24. When the tape stops, observe the DSKY indicates the following:

a. VERB 21 NOUN 02 Flashing
b. Row 1 indicates +
c. Row 3 indicates 12345

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

26. Observe the DSKY indicates the following:

a. VERB 21 NOUN 02
b. Row 1 indicates -06789
c. Row 3 indicates 12345

NOTE: If DSKY entries are being recorded on the CTS Tape Perforator, press to light RECORD pushbutton on Programmer and Monitor panel prior to performance of step 27.

27. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 06 NOUN 02 ENTR
c. 12345 ENTR
d. Observe Row 1 indicates -06789

---

28. Press TAPE FREE RUN and MONITOR pushbuttons on Programmer and Monitor panel. TAPE FREE RUN and AGC INPUT-CTR pushbuttons shall go out and MONITOR pushbutton shall light.

29. Press to extinguish TAPE READER, NEGATIVE and POSITIVE pushbuttons on the XY Interface panel. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

30. Press to extinguish SELF TEST pushbutton on Self Test panel. Rewind and remove tape from Tape Reader and set Power switch to OFF.

31. Perform the following DSKY operations:

a. VERB 36 ENTR
b. Press RSET

32. Set CONTINUITY TEST switch on Test Selector panel to 9.

33. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 291 to monitor the Continuity Test on the DVM.

34. Press CONTINUITY TEST pushbuttons on Test Selector panel. CONTINUITY TEST indicator shall light. DVM shall indicate 10 to 15 volts dc.

35. Press the CONTINUITY TEST pushbutton. CONTINUITY TEST indicator shall go out.

36. Remove Self Test Assembly from Buffer Box Assembly.

NOTE: Step 37 applies only if Restart Monitor Module (2898989) is installed.

37. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 12210 JDC
REV. N
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1A, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 16 18, 19, 20, 23, 24, 26, 27, 28, 29, 30, 34 and 35	Displays (Reacted as specified)						

DATE 30 JUN 66

JDC 12210 REV. - PAGE 1 OF 3

JOB CGC INPUT TEST

INITIAL TDRR 29882 DS PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check all CM spacecraft inputs to the CGC. All spacecraft inputs to the inbits of CH 30, 31, 32, 33 and 16 and uplink data inputs are simulated at the spacecraft interface by the CTS. All results are verified by interrogation of the CGC channels and registers.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

1. Insure that the ISS is in the Standby condition and that the CGC and 115V 400 CPS pushbuttons are ON.

2. Set the DE MARGINS switch to NORM on the RDC panel of the CTS.

3. Insure that the following pushbuttons on the RDC panel are not lighted.

CH30-14/IN0-14 through CH30-1/IN0-1
CH31-15/IN2-15 through CH31-1/IN2-1
CH32-15/IN3-15 through CH32-1/IN3-1
CH33-15, CH33-14, CH33-12, CH33-11
CH33-9 through CH33-1
CH16-7, CH16-6

NOTE: Any other pushbuttons not specified may be on or off.

CH30 INBIT TEST

4. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR

Row 1 shall indicate 37777 and Row 3 shall indicate 00030.

5. Press pushbuttons CH30-6/IN0-6 through CH30-1/IN0-1 lighting each specified pushbutton. Row 1 of the DSKY shall indicate 37700.

6. Press pushbuttons CH30-6/IN0-6 through CH30-1/IN0-1. Each pushbutton specified shall not be lighted. Row 1 of the DSKY shall indicate 37777.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB CGC INPUT TEST

JDC 12210 REV - PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

7. Perform the following DSKY operations:

a. NOUN 10 ENTR
b. 00031 ENTR

CH31 INBIT TEST

8. Press pushbuttons CH31-14/IN2-14 through CH31-1/IN2-1 lighting each specified pushbutton. Row 1 of the DSKY shall indicate 40000.

9. Press pushbuttons CH31-14/IN2-14 through CH31-1/IN2-1. Each specified pushbutton shall not be lighted. Row 1 of the DSKY shall indicate 77777.

CH32 INBIT TEST

10. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR

11. Set the Attitude Impulse Hand Control on the Indicator Control panel for the following positions and observe Row 1 of the DSKY for proper indications:

	Attitude Impulse Hand Control Position	DSKY Indication
a.	Up	77775
b.	Down	77776
c.	Left	77737
d.	Right	77757
e.	Clockwise	77773
f.	Counterclockwise	77767

12. Press pushbutton CH32-11/IN3-11. Row 1 of the DSKY shall indicate 75777.

13. Press pushbutton CH32-11/IN3-11. Row 1 of the DSKY shall indicate 77777.

UPLINK TEST

14. Make the following switch settings:

TAPE READER to ON
Press TAPE PREPARE pushbutton
TAPE PUNCH to ON
Press TAPE FREE RUN pushbutton
Press TAPE READER pushbutton
Press NEGATIVE pushbutton
Press POSITIVE pushbutton

15. Using the "0" and "1" keys on the Octal Keyboard, make a tape by punching the following from left to right. This tape should be prepared very carefully to insure a successful test.

a. 100010111010001
b. Press STOP CODE pushbutton

16. Press the TAPE PREPARE pushbutton to OFF and set the TAPE PUNCH switch to OFF.

17. Install the tape in the Tape Reader and make the following switch settings:

COUNTERS to Position 9
Press AGC COUNTERS pushbutton
Press CH33-10 pushbutton
UPLINK switch on the Indicator Control panel to ACCEPT.

DATE ________

JOB CGC INPUT TEST

JDC 12210 REV - PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

18. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

19. Press the EXECUTE pushbutton. When the tape stops, perform the following DSKY operations:

a. VERB 01 NOUN 01 ENTR
b. 00045 ENTR

Row 1 shall indicate 42721.

20. Set the CONTINUITY TEST selector on the Test Selector panel to position 9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 291.

21. Press the CONTINUITY TEST pushbutton and observe an indication of 10 to 15 volts dc on the DVM.

22. Press the CONTINUITY TEST pushbutton. The pushbutton shall go out.

23. Turn off all switches set to on in steps 14 through 19.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12210
REV. -
INITIAL TDRR 29882

JOB CGC INPUT TEST

ASSEMBLY UNDER TEST

TITLE ________
SER. NO. ________ DWG ________ REV. ________

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE
NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 15, 19, 21, 22, and 23	Displays (Reacted as specified)						

DATE ________

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV. B PAGE 1 OF 2

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates the operation of the cosecant circuit, resolution of the control stick, and slewing of the optics in the resolved mode.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
(M) A	11-10-66	31889	All	-	EA	-
B	2-2-67	32881	All	All	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: Set the G & N Mounting Fixture to the 0.0° position and perform JDC 12215 to establish a Master Initialization condition before proceeding with this JDC.

1. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Insure that the CH5 AC, OPT 800 ~ TO PH GEN, and 800 ~ 0 PH REFERENCE pushbuttons on the Oscillograph Signal Selector panel are lighted.

3. Set the CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 and monitor the SCT Trunnion Tach Mon. voltage.

4. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

5. Set the CONTROLLER COUPLING switch on the Indicator Control panel to DIRECT.

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After approximately 20 seconds, set the OPTICS MODE switch to CMC.

7. Perform the following DSKY operations:

VERB 41	NOUN 55	ENTR
+22500		ENTR
+10000		ENTR

Wait until optics stop driving before proceeding.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV B PAGE 2 OF 2

SUBSYSTEM G & N SYSTEM

ASSY

8. Set OPTICS MODE switch on Indicator Control panel to MAN.

9. Sight through the SCT eyepiece and center a convenient laboratory object (object number 1) on the SCT reticle pattern.

10. Set the CONTROLLER COUPLING switch on the Indicator Control panel to RSLV and the CONTROLLER SPEED switch to MED.

NOTE: Read and understand steps 11 and 12 before proceeding.

11. Set CHANNEL 5 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

12. Quickly displace the Optics hand controller 45 degrees in the upper right hand quadrant while sighting through the SCT eyepiece. Release the Optics hand controller and press the EVENT MARKER pushbutton on the Oscillograph Control panel when the object number 1 leaves the SCT upper right field of view. Simultaneously press the MARK pushbutton on the Indicator Control panel and record the Row 1 display of the DSKY.

13. Stop the Oscillograph and record the elapsed time between the rise of the SCT Trunnion Tach Feedback voltage and the EVENT MARKER indication on the Oscillograph chart.

14. Set the CONTROLLER COUPLING switch on the Indicator Control panel to DIRECT.

15. Set the OPTICS MODE switch to ZERO.

16. Rotate the RETICLE BRIGHTNESS thumbwheel fully downward.

17. Increase lamp brightness by rotating the RETICLE BRIGHTNESS thumbwheel upward. Verify that the following lamps vary from dim to bright.

a. Optical reticle patterns

b. SCT digital readouts

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12211
REV. B
INITIAL TDRR 29882

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE

NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
12	DSKY Row 1 Display (Shaft Angle)	degrees	+21500		+23500		
13	Time	seconds	18		30		
1, 2 17 and 18	Displays (Reacted as indicated)						

DATE 30 JUN 66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV. B PAGE 1 OF 2
INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION The test demonstrates the operation of the cosecant circuit, resolution of the control stick, and slewing of the optics in the resolved mode.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
(M) A	11-10-66	31889	All	-	EA	-
B	2-2-67	32881	All	All	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: Set the G & N Mounting Fixture to the 0.0° position and perform JDC 12215 to establish a Master Initialization condition before proceeding with this JDC.

1. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Insure that the CH5 AC, OPT 800 ~ TO PH GEN, and 800 ~ 0 PH REFERENCE pushbuttons on the Oscillograph Signal Selector panel are lighted.

3. Set the CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 and monitor the SCT Trunnion Tach Mon. voltage.

4. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

5. Set the CONTROLLER COUPLING switch on the Indicator Control panel to DIRECT.

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After approximately 20 seconds, set the OPTICS MODE switch to CMC.

7. Perform the following DSKY operations:

VERB 41	NOUN 55	ENTR
+22500		ENTR
+10000		ENTR

Wait until optics stop driving before proceeding.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM [illegible] Ch. 3-18-66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV B PAGE 2 OF 2

SUBSYSTEM G & N SYSTEM
ASSY

8. Set OPTICS MODE switch on Indicator Control panel to MAN.

9. Sight through the SCT eyepiece and center a convenient laboratory object (object number 1) on the SCT reticle pattern.

10. Set the CONTROLLER COUPLING switch on the Indicator Control panel to RSLV and the CONTROLLER SPEED switch to MED.

NOTE: Read and understand steps 11 and 12 before proceeding.

11. Set CHANNEL 5 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

12. Quickly displace the Optics hand controller 45 degrees in the upper right hand quadrant while sighting through the SCT eyepiece. Release the Optics hand controller and press the EVENT MARKER pushbutton on the Oscillograph Control panel when the object number 1 leaves the SCT upper right field of view. Simultaneously press the MARK pushbutton on the Indicator Control panel and record the Row 1 display of the DSKY.

13. Stop the Oscillograph and record the elapsed time between the rise of the SCT Trunnion Tach Feedback voltage and the EVENT MARKER indication on the Oscillograph chart.

14. Set the CONTROLLER COUPLING switch on the Indicator Control panel to DIRECT.

15. Set the OPTICS MODE switch to ZERO.

16. Rotate the RETICLE BRIGHTNESS thumbwheel fully downward.

17. Increase lamp brightness by rotating the RETICLE BRIGHTNESS thumbwheel upward. Verify that the following lamps vary from dim to bright.

a. Optical reticle patterns

b. SCT digital readouts

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 12211 JDC
REV. B
INITIAL TDRR 29832

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
12	DSKY Row 1 Display (Shaft Angle)	degrees	+21500		+23500		
13	Time	seconds	18		30		
1, 2 17 and 18	Displays (Reacted as indicated)						

DATE 30 JUN 66

FORM 00146
Chg. 7-23-65

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV. C PAGE 1 OF 2

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates the operation of the cosecant circuit, resolution of the control stick, and slewing of the optics in the resolved mode.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31889	All	-	EA	-
B	2-2-67	32881	All	All	EA	-
C	9-6-67	34560	1	-	EA	-

REFERENCES

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: Set the G & N Mounting Fixture to the 0.0° position and perform JDC 12215 to establish a Master Initialization condition before proceeding with this JDC.

1. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Insure that the CH5 AC, OPT 800 ~ TO PH GEN, and 800 ~ 0 PH REFERENCE pushbuttons on the Oscillograph Signal Selector panel are lighted.

3. Set the CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 and monitor the SCT Trunnion Tach Mon. voltage.

4. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

5. Set the CONTROLLER COUPLING switch on the Indicator Control panel to DIRECT.

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After approximately 20 seconds, set the OPTICS MODE switch to CMC.

7. Perform the following DSKY operations:

VERB 41	NOUN 55	ENTR
+22500		ENTR
+10000		ENTR

Wait until optics stop driving before proceeding.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV C PAGE 2 OF 2

SUBSYSTEM G & N SYSTEM

ASSY

8. Set OPTICS MODE switch on Indicator Control panel to MAN.

9. Sight through the SCT eyepiece and center a convenient laboratory object (object number 1) on the SCT reticle pattern.

10. Set the CONTROLLER COUPLING switch on the Indicator Control panel to RSLV and the CONTROLLER SPEED switch to MED.

NOTE: Read and understand steps 11 and 12 before proceeding.

11. Set CHANNEL 5 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

12. Quickly displace the Optics hand controller 45 degrees in the upper right hand quadrant while sighting through the SCT eyepiece. Release the Optics hand controller and press the EVENT MARKER pushbutton on the Oscillograph Control panel when the object number 1 leaves the SCT upper right field of view. Simultaneously press the MARK pushbutton on the Indicator Control panel and record the Row 1 display of the DSKY.

13. Stop the Oscillograph and record the elapsed time between the rise of the SCT Trunnion Tach Feedback voltage and the EVENT MARKER indication on the Oscillograph chart.

14. Set the CONTROLLER COUPLING switch on the Indicator Control panel to DIRECT.

15. Set the OPTICS MODE switch to ZERO.

16. Rotate the RETICLE BRIGHTNESS thumbwheel fully downward.

17. Increase lamp brightness by rotating the RETICLE BRIGHTNESS thumbwheel upward. Verify that the following lamps vary from dim to bright.

a. Optical reticle patterns

b. SCT digital readouts

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 12211 JDC
REV. C
INITIAL TDRR 29882

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

ASSEMBLY UNDER TEST

TITLE

SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
12	DSKY Row 1 Display (Shaft Angle)	degrees	+21500		+23500		
13	Time	seconds	18		30		
1, 2 17 and 18	Displays (Reacted as indicated)						

DATE 30 JUN 66

FCR 1 0136
Chg. 7-3-69

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV. D PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS. 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates the operation of the cosecant circuit, resolution of the control stick, and slewing of the optics in the resolved mode.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31889	All	-	EA	-
B	2-2-67	32881	All	All	EA	-
C	9-6-67	34560	1	-	EA	-
D	9-28-67	34740	All	All	EA	-

REFERENCES

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

1. Set G & N Mounting Fixture to the 0.0° position and perform JDC 12215 to establish a Master Initialization condition.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Press OPTICS POWER ON pushbutton on Test Control panel. The OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT.

2A. Press OPTICS POWER ON pushbutton on Test Control panel. The OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS TRACKER switch is set to OFF.

3. Insure that the CH5 AC, OPT 800~ TO PH GEN, and 800~ 0 PH REFERENCE pushbuttons on the Oscillograph Signal Selector panel are lighted.

4. Set the CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 and monitor the SCT Trunnion Tach Mon. voltage.

5. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV D PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Step 6 applies to Indicator Control panel 2021290 only. Step 6A applies to all Indicator Control panels except 2021290.

6. Set OPTICS COUPLING switch on Indicator Control panel to DIRECT.

6A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to DIRECT.

NOTE: Step 7 applies to Indicator Control panel 2021290 only. Step 7A applies to all Indicator Control panels except 2021290.

7. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to CMC.

7A. Set the OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to CMC.

8. Perform the following DSKY operations:

VERB 41	NOUN 55	ENTR
+22500		ENTR
+10000		ENTR

Wait until optics stop driving before proceeding.

9. Set OPTICS MODE switch on Indicator Control panel to MAN.

10. Sight through the SCT eyepiece and center a convenient laboratory object (object number 1) on the SCT reticle pattern.

NOTE: Step 11 applies to Indicator Control panel 2021290 only. Step 11A applies to all Indicator Control panels except 2021290.

11. Set OPTICS COUPLING switch on Indicator Control panel to RSLV and set OPTICS SPEED switch to MED.

11A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to RSLV and set OPTICS CONTROLLER SPEED switch to MED.

NOTE: Read and understand steps 12 and 13 before proceeding.

12. Set CHANNEL 5 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

13. Quickly displace the Optics hand controller 45 degrees in the upper right hand quadrant while sighting through the SCT eyepiece. Release the Optics hand controller and press the EVENT MARKER pushbutton on the Oscillograph Control panel when the object number 1 leaves the SCT upper right field of view. Simultaneously press the MARK pushbutton on the Indicator Control panel and record the Row 1 display of the DSKY.

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JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV D PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

14. Stop the Oscillograph and record the elapsed time between the rise of the SCT Trunnion Tach Feedback voltage and the EVENT MARKER indication on the Oscillograph chart.

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS COUPLING switch on Indicator Control panel to DIRECT.

15A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to DIRECT.

NOTE: Step 16 applies to Indicator Control panel 2021290 only. Step 16A applies to all Indicator Control panels except 2021290.

16. Set OPTICS ZERO switch to ZERO.

16A. Set OPTICS MODE switch to ZERO.

17. Rotate the RETICLE BRIGHTNESS thumbwheel fully downward.

18. Increase lamp brightness by rotating the RETICLE BRIGHTNESS thumbwheel upward. Verify that the following lamps vary from dim to bright.

a. Optical reticle patterns.

b. SCT digital readouts

19. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12211
REV. D
INITIAL TDRR 29882

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	DSKY Row 1 Display (Shaft Angle)	degrees	+21500		+23500		
14	Time	seconds	18		30		
2,3 18 and 19	Displays (Reacted as indicated)						

DATE 30 JUN 66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV. E PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates the operation of the cosecant circuit, resolution of the control stick, and slewing of the optics in the resolved mode.

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			JDC	D.S.	MIT	NASA
A	11-10-66	31889	All	-	EA	-
B	2-2-67	32881	All	All	EA	-
C	9-6-67	34560	1	-	EA	-
D	9-28-67	34740	All	All	EA	-
E	1-17-68	35456	2, 3	All	EA	-

REFERENCES

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

1. Set G & N Mounting Fixture to the 0.0° position and perform JDC 12215 to establish a Master Initialization condition.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Press OPTICS POWER ON pushbutton on Test Control panel. The OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT.

2A. Press OPTICS POWER ON pushbutton on Test Control panel. The OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS TRACKER switch is set to OFF.

3. Insure that the CH5 AC, OPT 800~ TO PH GEN, and 800~ 0 PH REFERENCE pushbuttons on the Oscillograph Signal Selector panel are lighted.

4. Set the CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 and monitor the SCT Trunnion Tach Mon. voltage.

5. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV E PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Step 6 applies to Indicator Control panel 2021290 only. Step 6A applies to all Indicator Control panels except 2021290.

6. Set OPTICS COUPLING switch on Indicator Control panel to DIRECT.

6A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to DIRECT.

NOTE: Step 7 applies to Indicator Control panel 2021290 only. Step 7A applies to all Indicator Control panels except 2021290.

7. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to CMC.

7A. Set the OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to CMC.

8. Perform the following DSKY operations:

VERB 41	NOUN 55	ENTR
+22500		ENTR
+10000		ENTR

Wait until optics stop driving before proceeding.

9. Set OPTICS MODE switch on Indicator Control panel to MAN.

10. Sight through the SCT eyepiece and center a convenient laboratory object (object number 1) on the SCT reticle pattern.

NOTE: Step 11 applies to Indicator Control panel 2021290 only. Step 11A applies to all Indicator Control panels except 2021290.

11. Set OPTICS COUPLING switch on Indicator Control panel to RSLV and set OPTICS SPEED switch to MED.

11A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to RSLV and set OPTICS CONTROLLER SPEED switch to MED.

NOTE: Read and understand steps 12 and 13 before proceeding.

12. Set CHANNEL 5 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

13. Quickly displace the Optics Hand Controller 45 degrees in the upper right hand quadrant while sighting through the SCT eyepiece. Release the Optics Hand Controller and press the EVENT MARKER pushbutton on the Oscillograph Control panel when the point on object number 1 centered in step 10 leaves the SCT upper right field of view. Simultaneously press the MARK pushbutton on the Indicator Control panel

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JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV E PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

and record the Row 1 display of the DSKY.

14. Stop the Oscillograph and record the elapsed time between the rise of the SCT Trunnion Tach Feedback voltage and the EVENT MARKER indication on the Oscillograph chart.

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS COUPLING switch on Indicator Control panel to DIRECT.

15A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to DIRECT.

NOTE: Step 16 applies to Indicator Control panel 2021290 only. Step 16A applies to all Indicator Control panels except 2021290.

16. Set OPTICS ZERO switch to ZERO.

16A. Set OPTICS MODE switch to ZERO.

17. Rotate the RETICLE BRIGHTNESS thumbwheel fully downward.

18. Increase lamp brightness by rotating the RETICLE BRIGHTNESS thumbwheel upward. Verify that the following lamps vary from dim to bright.

a. SCT reticle pattern

b. SCT digital readouts

19. Remove air focus shim and filter and look through the SXT eyepiece focused on the vacuum reticle into a dark background. Observe that the SXT vacuum reticle is illuminated. Replace air focus shim and filter.

20. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12211
REV. E
INITIAL TDRR 29882

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE

NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION

APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	DSKY Row 1 Display (Shaft Angle)	degrees	+21500		+23500		
14	Time	seconds	18		30		
2, 3, 18, 19, and 20	Displays (Reacted as indicated)						

DATE 30 JUN 66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV. F PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates the operation of the cosecant circuit, resolution of the control stick, and slewing of the optics in the resolved mode.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31889	All	-	EA	-
B	2-2-67	32881	All	All	EA	-
C	9-6-67	34560	1	-	EA	-
D	9-28-67	34740	All	All	EA	-
E	1-17-68	35456	2, 3	All	EA	-
F	5-2-68	36155	All	-	EA	-

REFERENCES

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

1. Set G & N Mounting Fixture to the 0.0° position and perform JDC 12215 to establish a Master Initialization condition.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Press OPTICS POWER ON pushbutton on Test Control panel. The OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT.

2A. Press OPTICS POWER ON pushbutton on Test Control panel. The OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS TRACKER switch is set to OFF.

3. Insure that the CH5 AC, OPT 800~ TO PH GEN, and 800~ 0 PH REFERENCE pushbuttons on the Oscillograph Signal Selector panel are lighted.

4. Set the CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 and monitor the SCT Trunnion Tach Mon. voltage.

5. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV F PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Step 6 applies to Indicator Control panel 2021290 only. Step 6A applies to all Indicator Control panels except 2021290.

6. Set OPTICS COUPLING switch on Indicator Control panel to DIRECT.

6A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to DIRECT.

6B. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 7 applies to Indicator Control panel 2021290 only. Step 7A applies to all Indicator Control panels except 2021290.

7. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to CMC.

7A. Set the OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to CMC.

8. Perform the following DSKY operations:

VERB 41	NOUN 55	ENTR
+32500		ENTR
+10000		ENTR

Wait until optics stop driving before proceeding.

9. Set OPTICS MODE switch on Indicator Control panel to MAN.

10. Sight through the SCT eyepiece and center a convenient laboratory object (object number 1) on the SCT reticle pattern.

NOTE: Step 11 applies to Indicator Control panel 2021290 only. Step 11A applies to all Indicator Control panels except 2021290.

11. Set OPTICS COUPLING switch on Indicator Control panel to RSLV and set OPTICS SPEED switch to MED.

11A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to RSLV and set OPTICS CONTROLLER SPEED switch to MED.

NOTE: Read and understand steps 12 and 13 before proceeding.

12. Set CHANNEL 5 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

13. Quickly displace the Optics Hand Controller 45 degrees in the upper right hand quadrant while sighting through the SCT eyepiece. Release the Optics Hand Controller and press the EVENT MARKER pushbutton on the Oscillograph Control panel when the point on object number 1 centered in step 10 leaves

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JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV F PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

the SCT upper right field of view. Simultaneously press the MARK pushbutton on the Indicator Control panel and record the Row 1 display of the DSKY.

14. Stop the Oscillograph and record the elapsed time between the rise of the SCT Trunnion Tach Feedback voltage and the EVENT MARKER indication on the Oscillograph chart.

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS COUPLING switch on Indicator Control panel to DIRECT.

15A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to DIRECT.

15B. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 16 applies to Indicator Control panel 2021290 only. Step 16A applies to all Indicator Control panels except 2021290.

16. Set OPTICS ZERO switch to ZERO.

16A. Set OPTICS MODE switch to ZERO.

17. Rotate the RETICLE BRIGHTNESS thumbwheel fully downward.

18. Increase lamp brightness by rotating the RETICLE BRIGHTNESS thumbwheel upward. Verify that the following lamps vary from dim to bright.

a. SCT reticle pattern

b. SCT digital readouts

19. Remove air focus shim and filter and look through the SXT eyepiece focused on the vacuum reticle into a dark background. Observe that the SXT vacuum reticle is illuminated. Replace air focus shim and filter.

20. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

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REV. F
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JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

ASSEMBLY UNDER TEST

TITLE
SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	DSKY Row 1 Display (Shaft Angle)	degrees	+21500		+23500		
14	Time	seconds	18		30		
2, 3, 18, 19, and 20	Displays (Reacted as indicated)						

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JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST	JDC 12211 REV. G PAGE 1 OF 3 INITIAL TDRR 29882 D.S. PGS 1
SUBSYSTEM G & N SYSTEM	ASSY.

DESCRIPTION The test demonstrates the operation of the cosecant circuit, resolution of the control stick, and slewing of the optics in the resolved mode.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31889	All	-	EA	-
B	2-2-67	32881	All	All	EA	-
C	9-6-67	34560	1	-	EA	-
D	9-28-67	34740	All	All	EA	-
E	1-17-68	35456	2, 3	All	EA	-
F	5-2-68	36155	All	-	EA	-
G	5-26-70	38122	1, 3	-	EA	-

REFERENCES

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike cradle locking handles.

1. Set G & N Mounting Fixture to the 0.0° position and perform JDC 12215 to establish a Master Initialization condition.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Press OPTICS POWER ON pushbutton on Test Control panel. The OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT.

2A. Press OPTICS POWER ON pushbutton on Test Control panel. The OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS TRACKER switch is set to OFF.

3. Insure that the CH5 AC, OPT 800~ TO PH GEN, and 800~ 0 PH REFERENCE pushbuttons on the Oscillograph Signal Selector panel are lighted.

4. Set the CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 and monitor the SCT Trunnion Tach Mon. voltage.

5. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

NOTE: Step 6 applies to Indicator Control panel 2021290 only. Step 6A applies to all Indicator Control panels except 2021290.

6. Set OPTICS COUPLING switch on Indi-

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST	JDC 12211 REV G PAGE 2 OF 3
SUBSYSTEM G & N SYSTEM	ASSY

cator Control panel to DIRECT.

6A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to DIRECT.

6B. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 7 applies to Indicator Control panel 2021290 only. Step 7A applies to all Indicator Control panels except 2021290.

7. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to CMC.

7A. Set the OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to CMC.

8. Perform the following DSKY operations:

VERB 41	NOUN 55	ENTR
+22500		ENTR
+10000		ENTR

Wait until optics stop driving before proceeding.

9. Set OPTICS MODE switch on Indicator Control panel to MAN.

10. Sight through the SCT eyepiece and center a convenient laboratory object (object number 1) on the SCT reticle pattern.

NOTE: Step 11 applies to Indicator Control panel 2021290 only. Step 11A applies to all Indicator Control panels except 2021290.

11. Set OPTICS COUPLING switch on Indicator Control panel to RSLV and set OPTICS SPEED switch to MED.

11A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to RSLV and set OPTICS CONTROLLER SPEED switch to MED.

NOTE: Read and understand steps 12 and 13 before proceeding.

12. Set CHANNEL 5 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

13. Quickly displace the Optics Hand Controller 45 degrees in the upper right hand quadrant while sighting through the SCT eyepiece. Release the Optics Hand Controller and press the EVENT MARKER pushbutton on the Oscillograph Control panel when the point on object number 1 centered in step 10 leaves the SCT upper right field of view. Simultaneously press the MARK pushbutton on the Indicator Control panel and record the Row 1 display of the DSKY.

14. Stop the Oscillograph and record the elapsed time between the rise of the SCT Trunnion Tach Feedback voltage and the EVENT MARKER indication on the

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JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST	JDC 12211 REV G PAGE 3 OF 3
SUBSYSTEM G & N SYSTEM	ASSY

Oscillograph chart.

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS COUPLING switch on Indicator Control panel to DIRECT.

15A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to DIRECT.

15B. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 16 applies to Indicator Control panel 2021290 only. Step 16A applies to all Indicator Control panels except 2021290.

16. Set OPTICS ZERO switch to ZERO.

16A. Set OPTICS MODE switch to ZERO.

17. Rotate the RETICLE BRIGHTNESS thumbwheel fully downward.

18. Increase lamp brightness by rotating the RETICLE BRIGHTNESS thumbwheel upward. Verify that the following lamps vary from dim to bright.

a. SCT reticle pattern

b. SCT digital readouts

19. Remove air focus shim and filter and look through the SXT eyepiece focused on the vacuum reticle into a dark background. Observe that the SXT vacuum reticle is illuminated. Replace air focus shim and filter.

20. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

NOTE: Step 21 applies only if Restart Monitor module (2898989) is installed.

21. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00077 ENTR

c. The contents of Row 1 shall be 00000.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 12211 JDC
REV. G
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JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ____ CAL DATE

NAME ______ SER. NO. ____ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	DSKY Row 1 Display (Shaft Angle)	degrees	+21500		+23500		
14	Time	seconds	18		30		
2, 3, 18, 19, and 20	Displays (Reacted as indicated)						

DATE 30 JUN 66

FORM 0046
CAL 7-21-65

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

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INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates the operation of the cosecant circuit, resolution of the control stick, and slewing of the optics in the resolved mode.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31889	All	-	EA	-
B	2-2-67	32881	All	All	EA	-
C	9-6-67	34560	1	-	EA	-
D	9-28-67	34740	All	All	EA	-
E	1-17-68	35456	2, 3	All	EA	-
F	5-2-68	36155	All	-	EA	-
G	5-26-70	38122	1, 3	-	EA	-
H	2-8-71	38335	3, 4	1	EA JA	-

REFERENCES

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike cradle locking handles.

1. Set G & N Mounting Fixture to the 0.0° position and perform JDC 12215 to establish a Master Initialization condition.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Press OPTICS POWER ON pushbutton on Test Control panel. The OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT.

2A. Press OPTICS POWER ON pushbutton on Test Control panel. The OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS TRACKER switch is set to OFF.

3. Insure that the CH5 AC, OPT 800~ TO PH GEN, and 800~ 0 PH REFERENCE pushbuttons on the Oscillograph Signal Selector panel are lighted.

4. Set the CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 and monitor the SCT Trunnion Tach Mon. voltage.

5. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

NOTE: Step 6 applies to Indicator Control panel 2021290 only. Step 6A applies to all Indicator Control panels except 2021290.

6. Set OPTICS COUPLING switch on Indi-

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

JDC 12211 REV H PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

cator Control panel to DIRECT.

6A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to DIRECT.

6B. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 7 applies to Indicator Control panel 2021290 only. Step 7A applies to all Indicator Control panels except 2021290.

7. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to CMC.

7A. Set the OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to CMC.

8. Perform the following DSKY operations:

VERB 41 NOUN 55 ENTR
+22500 ENTR
+10000 ENTR

Wait until optics stop driving before proceeding.

9. Set OPTICS MODE switch on Indicator Control panel to MAN.

10. Sight through the SCT eyepiece and center a convenient laboratory object (object number 1) on the SCT reticle pattern.

NOTE: Step 11 applies to Indicator Control panel 2021290 only. Step 11A applies to all Indicator Control panels except 2021290.

11. Set OPTICS COUPLING switch on Indicator Control panel to RSLV and set OPTICS SPEED switch to MED.

11A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to RSLV and set OPTICS CONTROLLER SPEED switch to MED.

NOTE: Read and understand steps 12 and 13 before proceeding.

12. Set CHANNEL 5 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

13. Quickly displace the Optics Hand Controller 45 degrees in the upper right hand quadrant while sighting through the SCT eyepiece. Release the Optics Hand Controller and press the EVENT MARKER pushbutton on the Oscillograph Control panel when the point on object number 1 centered in step 10 leaves the SCT upper right field of view. Simultaneously press the MARK pushbutton on the Indicator Control panel and record the Row 1 display of the DSKY.

14. Stop the Oscillograph and record the elapsed time between the rise of the SCT Trunnion Tach Feedback voltage and the EVENT MARKER indication on the

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JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

Oscillograph chart.

14A. Set Optics Mode switch to CMC. Wait until optics stop driving before proceeding.

14B. Set Optics Mode switch to MAN.

14C. Sight through the SCT eyepiece and observe image motion while displacing the Optics Hand Controller for a maximum of ten seconds in each direction as follows:

a. Displaced up, image moves in a straight line vertically up.

b. Displaced right, image moves in a straight line horizontally right.

c. Displaced left, image moves in a straight line horizontally left.

d. Displaced down, image moves in a straight line vertically down.

14D. Record whether image motion responded to Hand Controller inputs as specified.

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS COUPLING switch on Indicator Control panel to DIRECT.

15A. Set OPTICS CONTROLLER COUPLING switch on Indicator Control panel to DIRECT.

15B. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 16 applies to Indicator Control panel 2021290 only. Step 16A applies to all Indicator Control panels except 2021290.

16. Set OPTICS ZERO switch to ZERO.

16A. Set OPTICS MODE switch to ZERO.

17. Rotate the RETICLE BRIGHTNESS thumbwheel fully downward.

18. Increase lamp brightness by rotating the RETICLE BRIGHTNESS thumbwheel upward. Verify that the following lamps vary from dim to bright.

a. SCT reticle pattern

b. SCT digital readouts

19. Remove air focus shim and filter and look through the SXT eyepiece focused on the vacuum reticle into a dark background. Observe that the SXT vacuum reticle is illuminated. Replace air focus shim and filter.

20. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

NOTE: Step 21 applies only if Restart Monitor module (2898989) is installed.

21. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00077 ENTR

c. The contents of Row 1 shall be 00000.

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EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 12211 JDC
REV. H
INITIAL TDRR 29882

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION ______

TIME ______ START ______ END ______ TOTAL ELAPSED ______

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______

NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION

APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	DSKY Row 1 Display (Shaft Angle)	degrees	+21500		+23500		
14	Time	seconds	17		28		
2, 3, 18, 19, and 20	Displays (Reacted as indicated)						
14D	Image Motion (Responded as specified)						

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JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

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INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates the operation of the cosecant circuit, resolution of the control stick, and slewing of the optics in the resolved mode.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position and a Master Initialization Condition shall be established.

1. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Insure that the CH5 AC, OPT 800 ~ TO PH GEN, and 800 ~ 0 PH REFERENCE pushbuttons on the Oscillograph Signal Selector panel are lighted.

3. Set the CHANNEL 5 switch on the Oscillograph Signal Selector panel to 11 and monitor the SCT Trunnion Tach Mon. voltage.

4. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

5. Set the CONTROLLER COUPLING switch on the Indicator Control panel to DIRECT.

6, Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT Shaft Angle Displayed on Row 1.

c. Observe SXT TRN LOS Angle Displayed on Row 2.

7. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After approximately 20 seconds the DSKY displays all zeros on Row 1 and Row 2, set the OPTICS MODE switch to MAN.

8. Using the Optics hand controller, drive the optics to the position where Row 1 of

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

the DSKY displays the Shaft angle as +22500 and Row 2 displays the Trunnion LOS angle as +10000.

9. Sight through the SCT eyepiece and center a convenient laboratory object (object number 1) on the SCT reticle pattern.

10. Set the CONTROLLER COUPLING switch on the Indicator Control panel to RSLV and the CONTROLLER SPEED switch to MED.

NOTE: Read and understand steps 11 and 12 before proceeding.

11. Set CHANNEL 5 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

12. Quickly displace the Optics hand controller 45 degrees in the upper right hand quadrant while sighting through the SCT eyepiece. Release the Optics hand controller and press the EVENT MARKER pushbutton on the Oscillograph Control panel when the object number 1 leaves the SCT upper right field of view. Simultaneously press the MARK pushbutton on the Indicator Control panel and record the Row 1 display of the DSKY.

13. Stop the Oscillograph and record the elapsed time between the rise of the SCT Trunnion Tach Feedback voltage and the EVENT MARKER indication on the Oscillograph chart.

14. Set the CONTROLLER COUPLING switch on the Indicator Control panel to DIRECT.

15. Set the OPTICS MODE switch to ZERO.

16. Rotate the RETICLE BRIGHTNESS thumbwheel fully downward.

17. Increase lamp brightness by rotating the RETICLE BRIGHTNESS thumbwheel upward. Verify that the following lamps vary from dim to bright.

a. Optical reticle patterns

b. SCT digital readouts

DATE ________

APOLLO G&N
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JOB OPTICS COORDINATE TRANSFORMATION CONTROL TEST

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ______ CAL DATE ______

NAME ________ SER. NO. ______ CAL DATE ______

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
12	DSKY Row 1 Display (Shaft Angle)	degrees	+21500		+23500		
13	Time	seconds	18		30		
1, 2 6, 8 and 27	Displays (Reacted as indicated)						

DATE ________

JDC 12212 REV. A PAGE 1 OF 3

JOB ZERO OPTICS TEST

INITIAL TDRR 29882 D.S. PGS. 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates optics time to zero and CDU zeroing accuracy. Telemetry input signals, and PSA test points are also checked.

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			JDC	D.S.	MIT	NASA
A	11-10-66	31890	1.3	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT SHAFT angle is displayed on Row 1.

c. Observe SXT TRN LOS angle is displayed on Row 2.

3. Set the CONTROLLER COUPLING switch to DIRECT, the CONTROLLER SPEED switch to HI and the OPTICS MODE switch to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB ZERO OPTICS TEST

JDC 12212 REV A PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

4. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. ϕ1 on Oscilloscope A.

5. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand controller.

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. ϕ 1 on Oscilloscope A.

8. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set the OPTICS MODE switch on the Indicator Control panel to ZERO.

OPTICS TIME TO ZERO

9. Insure that the CH 5 AC pushbutton on the Oscillograph Signal Selector panel is lighted.

10. Set CHANNEL 1 switch to 13 and CHANNEL 5 switch to 11 to monitor the following signal outputs:

a. SCT Shaft MDA Tach Mon. voltage on CHANNEL 1.

b. SCT Trunnion MDA Tach Mon. voltage on CHANNEL 5.

11. Set the OPTICS MODE switch on the Indicator Control panel to MAN.

12. Set the CONTROLLER SPEED switch to LO. Using the Optics hand controller, drive the optics increasing to the position where the DSKY Row 1 indicates +27000 and Row 2 indicates +75000.

13. Press the CHART SPEEDS 10 pushbutton on the Oscillograph Control panel and set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 100 MV/MM

b. CHANNEL 5 to 100 MV/MM

14. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and note that steady state signals appear on the Oscillograph chart.

15. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

16. When all signals reach steady state values, record DSKY Row 1 and Row 2 indications. Wait approximately 5 seconds and set the CHART DRIVE switch on the Oscillograph Control panel to OFF. Set all sensitivities on the Oscillograph Amplifier to OFF.

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JOB ZERO OPTICS TEST

JDC 12212 REV A PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

17. Record the elapsed time between the steady state nulls on the Oscillograph chart for CHANNELS 1 and 5.

18. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and inphase voltage of the following signals on the PAVM:

a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.

b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

19. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

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EQUIPMENT TEST
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JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION

APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	SCT Trunnion MDA Output	v p-p	5		15		
8	SCT Shaft MDA Output Mon.	v p-p	10		25		
16	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
17	SCT Shaft Time to Zero (CH 1)	sec	0		15		
	SCT Trunnion Time to Zero (CH 5)	sec	0		15		
18	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		

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JOB ZERO OPTICS TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19 (cont)	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

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JOB ZERO OPTICS TEST | JDC 12212 REV. B PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The test demonstrates optics time to zero and CDU zeroing accuracy. Telemetry input signals, and PSA test points are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
Ⓜ A	11-10-66	31890	1,3	-	EA	-
B	1-12-67	32620	2	2	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT SHAFT angle is displayed on Row 1.

c. Observe SXT TRN LOS angle is displayed on Row 2.

3. Set the CONTROLLER COUPLING switch to DIRECT, the CONTROLLER SPEED switch to HI and the OPTICS MODE switch to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM G & N SYSTEM | ASSY

4. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. ϕ1 on Oscilloscope A.

5. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand controller.

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. ϕ 1 on Oscilloscope A.

8. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set the OPTICS MODE switch on the Indicator Control panel to ZERO.

OPTICS TIME TO ZERO

9. Insure that the CH 5 AC pushbutton on the Oscillograph Signal Selector panel is lighted.

10. Set CHANNEL 1 switch to 13 and CHANNEL 5 switch to 11 to monitor the following signal outputs:

a. SCT Shaft MDA Tach Mon. voltage on CHANNEL 1.

b. SCT Trunnion MDA Tach Mon. voltage on CHANNEL 5.

11. Set the OPTICS MODE switch on the Indicator Control panel to MAN.

12. Set the CONTROLLER SPEED switch to HI. Using the Optics hand controller, drive the optics increasing to the position where the DSKY Row 1 indicates approximately +27000 and Row 2 indicates approximately +75000. Set the CONTROLLER SPEED switch to LO and drive the optics until Row 1 indicates +27000 (±00010) and Row 2 indicates +75000 (±00010).

13. Press the CHART SPEEDS 10 pushbutton on the Oscillograph Control panel and set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 100 MV/MM

b. CHANNEL 5 to 100 MV/MM

14. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and note that steady state signals appear on the Oscillograph chart.

15. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

16. When all signals reach steady state values, record DSKY Row 1 and Row 2 indications. Wait approximately 5 seconds and set the CHART DRIVE switch on the Oscillograph Control panel to OFF. Set all sensitivities on the Oscillograph Amplifier to OFF.

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JOB ZERO OPTICS TEST | JDC 12212 REV B PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

17. Record the elapsed time between the steady state nulls on the Oscillograph chart for CHANNELS 1 and 5.

18. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and inphase voltage of the following signals on the PAVM:

a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.

b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

19. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

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EQUIPMENT TEST
DATA SHEET 1 OF 2

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JOB ZERO OPTICS TEST

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TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION
APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	SCT Trunnion MDA Output	v p-p	5		15		
8	SCT Shaft MDA Output Mon.	v p-p	10		25		
16	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
17	SCT Shaft Time to Zero (CH 1)	sec	0		15		
	SCT Trunnion Time to Zero (CH 5)	sec	0		15		
18	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		

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JOB ZERO OPTICS TEST

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INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates optics time to zero and CDU zeroing accuracy. Telemetry input signals, and PSA test points are also checked.

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			JDC	D.S.	MIT	NASA
(M) A	11-10-66	31890	1,3	-	EA	-
B	1-12-67	32620	2	2	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT SHAFT angle is displayed on Row 1.

c. Observe SXT TRN LOS angle is displayed on Row 2.

3. Set the CONTROLLER COUPLING switch to DIRECT, the CONTROLLER SPEED switch to HI and the OPTICS MODE switch to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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Chg. 7-23-65

JOB ZERO OPTICS TEST

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SUBSYSTEM G & N SYSTEM

ASSY

4. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. ϕ1 on Oscilloscope A.

5. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand controller.

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. ϕ 1 on Oscilloscope A.

8. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set the OPTICS MODE switch on the Indicator Control panel to ZERO.

OPTICS TIME TO ZERO

9. Insure that the CH 5 AC pushbutton on the Oscillograph Signal Selector panel is lighted.

10. Set CHANNEL 1 switch to 13 and CHANNEL 5 switch to 11 to monitor the following signal outputs:

a. SCT Shaft MDA Tach Mon. voltage on CHANNEL 1.

b. SCT Trunnion MDA Tach Mon. voltage on CHANNEL 5.

11. Set the OPTICS MODE switch on the Indicator Control panel to MAN.

12. Set the CONTROLLER SPEED switch to HI. Using the Optics hand controller, drive the optics increasing to the position where the DSKY Row 1 indicates approximately +27000 and Row 2 indicates approximately +75000. Set the CONTROLLER SPEED switch to LO and drive the optics until Row 1 indicates +27000 (±00010) and Row 2 indicates +75000 (±00010).

13. Press the CHART SPEEDS 10 pushbutton on the Oscillograph Control panel and set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 100 MV/MM

b. CHANNEL 5 to 100 MV/MM

14. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and note that steady state signals appear on the Oscillograph chart.

15. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

16. When all signals reach steady state values, record DSKY Row 1 and Row 2 indications. Wait approximately 5 seconds and set the CHART DRIVE switch on the Oscillograph Control panel to OFF. Set all sensitivities on the Oscillograph Amplifier to OFF.

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JOB ZERO OPTICS TEST

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SUBSYSTEM G & N SYSTEM

ASSY

17. Record the elapsed time between the steady state nulls on the Oscillograph chart for CHANNELS 1 and 5.

18. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and in-phase voltage of the following signals on the PAVM:

a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.

b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

19. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12212
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JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE

NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	SCT Trunnion MDA Output	v p-p	5		15		
8	SCT Shaft MDA Output Mon.	v p-p	10		25		
16	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
17	SCT Shaft Time to Zero (CH 1)	sec	0		15		
	SCT Trunnion Time to Zero (CH 5)	sec	0		15		
18	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		

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Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12212
REV. F

JOB ZERO OPTICS TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18 (cont)	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

FORM 00155
New 1-30-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 122 2
REV. B

JOB ZERO OPTICS TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18 (cont)	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

FORM 00-55
New 9-30-65

JOB ZERO OPTICS TEST | JDC 12212 REV. C PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The test demonstrates optics time to zero and CDU zeroing accuracy. Telemetry input signals, and PSA test points are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31890	1,3	-	EA	-
B	1-12-67	32620	2	2	EA	-
C	2-2-67	32882	All	All	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Set the CONTROLLER COUPLING switch to DIRECT, the CONTROLLER SPEED switch to HI and the OPTICS MODE switch to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. ϕ1 on Oscilloscope A.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ZERO OPTICS TEST | JDC 12212 REV C PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

4. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand controller.

5. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. ϕ 1 on Oscilloscope A.

7. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set the OPTICS MODE switch on the Indicator Control panel to ZERO.

OPTICS TIME TO ZERO

8. Insure that the CH 5 AC pushbutton on the Oscillograph Signal Selector panel is lighted.

9. Set CHANNEL 1 switch to 13 and CHANNEL 5 switch to 11 to monitor the following signal outputs:

a. SCT Shaft MDA Tach Mon. voltage on CHANNEL 1.

b. SCT Trunnion MDA Tach Mon. voltage on CHANNEL 5.

10. Set the OPTICS MODE switch on the Indicator Control panel to CMC.

11. Perform the following DSKY operations:

VERB 41 NOUN 55 ENTR
+27000 ENTR
+75000 ENTR

Wait until optics stop driving before proceeding.

12. Press the CHART SPEEDS 10 pushbutton on the Oscillograph Control panel and set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 100 MV/MM

b. CHANNEL 5 to 100 MV/MM

13. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and note that steady state signals appear on the Oscillograph chart.

14. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

15. When all signals reach steady state values, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record DSKY Row 1 and Row 2 indications. Wait approximately 5 seconds and set the CHART DRIVE switch on the Oscillograph Control panel to OFF. Set all sensitivities on the Oscillograph Amplifier to OFF.

16. Record the elapsed time between the steady state nulls on the Oscillograph chart for CHANNELS 1 and 5.

DATE 30 JUN 66

JOB ZERO OPTICS TEST | JDC 12212 REV C PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

17. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and in-phase voltage of the following signals on the PAVM:

a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.

b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

NO. 12212 JDC
REV. C
INITIAL TDRR 29882

JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	SCT Trunnion MDA Output	v p-p	5		15		
7	SCT Shaft MDA Output Mon.	v p-p	10		25		
15	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
16	SCT Shaft Time to Zero (CH 1)	sec	0		15		
	SCT Trunnion Time to Zero (CH 5)	sec	0		15		
17	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

FORM 0146
Chg. 7-13-65

JOB ZERO OPTICS TEST | **JDC** 12212 **REV.** C **PAGE** 1 **OF** 3

INITIAL TDRR 29882 **D.S. PGS** 2

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION The test demonstrates optics time to zero and CDU zeroing accuracy. Telemetry input signals, and PSA test points are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31890	1,3	-	EA	-
B	1-12-67	32620	2	2	EA	-
C	2-2-67	32882	All	All	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Set the CONTROLLER COUPLING switch to DIRECT, the CONTROLLER SPEED switch to HI and the OPTICS MODE switch to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. ϕ1 on Oscilloscope A.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ZERO OPTICS TEST | **JDC** 12212 **REV** C **PAGE** 2 **OF** 3

SUBSYSTEM G & N SYSTEM | **ASSY**

4. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand controller.

5. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. ϕ 1 on Oscilloscope A.

7. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set the OPTICS MODE switch on the Indicator Control panel to ZERO.

OPTICS TIME TO ZERO

8. Insure that the CH 5 AC pushbutton on the Oscillograph Signal Selector panel is lighted.

9. Set CHANNEL 1 switch to 13 and CHANNEL 5 switch to 11 to monitor the following signal outputs:

a. SCT Shaft MDA Tach Mon. voltage on CHANNEL 1.

b. SCT Trunnion MDA Tach Mon. voltage on CHANNEL 5.

10. Set the OPTICS MODE switch on the Indicator Control panel to CMC.

11. Perform the following DSKY operations:

VERB 41	NOUN 55	ENTR
+27000		ENTR
+75000		ENTR

Wait until optics stop driving before proceeding.

12. Press the CHART SPEEDS 10 pushbutton on the Oscillograph Control panel and set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 100 MV/MM

b. CHANNEL 5 to 100 MV/MM

13. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and note that steady state signals appear on the Oscillograph chart.

14. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

15. When all signals reach steady state values, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record DSKY Row 1 and Row 2 indications. Wait approximately 5 seconds and set the CHART DRIVE switch on the Oscillograph Control panel to OFF. Set all sensitivities on the Oscillograph Amplifier to OFF.

16. Record the elapsed time between the steady state nulls on the Oscillograph chart for CHANNELS 1 and 5.

DATE 30 JUN 66

JOB ZERO OPTICS TEST | **JDC** 12212 **REV** C **PAGE** 3 **OF** 3

SUBSYSTEM G & N SYSTEM | **ASSY**

17. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and in-phase voltage of the following signals on the PAVM:

a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.

b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 2

NO. 12212 JDC
REV. C
INITIAL TDRR 29882

JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ **DWG** ______ **REV.** ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ **SER. NO.** ______ CAL DATE

NAME ______ **SER. NO.** ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION **APPROVED BY** ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	SCT Trunnion MDA Output	v p-p	5		15		
7	SCT Shaft MDA Output Mon.	v p-p	10		25		
15	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
16	SCT Shaft Time to Zero (CH 1)	sec	0		15		
	SCT Trunnion Time to Zero (CH 5)	sec	0		15		
17	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

FORM 0014
Chg. 7-23-63

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12212
REV. C

JOB ZERO OPTICS TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17 (cont)	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

FORM [illegible]
New [illegible]

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12212
REV. C

JOB ZERO OPTICS TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17 (cont)	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

FORM 0[illegible]55
New 9-30-65

JOB ZERO OPTICS TEST | JDC 12212 REV. D PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The test demonstrates optics time to zero and CDU zeroing accuracy. Telemetry input signals, and PSA test points are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31890	1,3	-	EA	-
B	1-12-67	32620	2	2	EA	-
C	2-2-67	32882	All	All	EA	-
D	9-6-67	34560	1	-	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Set the CONTROLLER COUPLING switch to DIRECT, the CONTROLLER SPEED switch to HI and the OPTICS MODE switch to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. $\phi 1$ on Oscilloscope A.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ZERO OPTICS TEST | JDC 12212 REV D PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

4. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand controller.

5. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. $\phi 1$ on Oscilloscope A.

7. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set the OPTICS MODE switch on the Indicator Control panel to ZERO.

OPTICS TIME TO ZERO

8. Insure that the CH 5 AC pushbutton on the Oscillograph Signal Selector panel is lighted.

9. Set CHANNEL 1 switch to 13 and CHANNEL 5 switch to 11 to monitor the following signal outputs:

a. SCT Shaft MDA Tach Mon. voltage on CHANNEL 1.

b. SCT Trunnion MDA Tach Mon. voltage on CHANNEL 5.

10. Set the OPTICS MODE switch on the Indicator Control panel to CMC.

11. Perform the following DSKY operations:

VERB 41	NOUN 55	ENTR
+27000		ENTR
+75000		ENTR

Wait until optics stop driving before proceeding.

12. Press the CHART SPEEDS 10 pushbutton on the Oscillograph Control panel and set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 100 MV/MM

b. CHANNEL 5 to 100 MV/MM

13. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and note that steady state signals appear on the Oscillograph chart.

14. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

15. When all signals reach steady state values, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record DSKY Row 1 and Row 2 indications. Wait approximately 5 seconds and set the CHART DRIVE switch on the Oscillograph Control panel to OFF. Set all sensitivities on the Oscillograph Amplifier to OFF.

16. Record the elapsed time between the steady state nulls on the Oscillograph chart for CHANNELS 1 and 5.

DATE 30 JUN 66

JOB ZERO OPTICS TEST | JDC 12212 REV D PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

17. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and inphase voltage of the following signals on the PAVM:

a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.

b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12212
REV. D
INITIAL TDRR 29882

JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION

APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	SCT Trunnion MDA Output	v p-p	5		15		
7	SCT Shaft MDA Output Mon.	v p-p	10		25		
15	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
16	SCT Shaft Time to Zero (CH 1)	sec	0		15		
	SCT Trunnion Time to Zero (CH 5)	sec	0		15		
17	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12212
REV. D

JOB ZERO OPTICS TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17 (cont)	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

FORM [illegible]
[illegible]

JOB ZERO OPTICS TEST

JDC 12212 REV. E PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates optics time to zero and CDU zeroing accuracy. Telemetry input signals, and PSA test points are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	11-10-66	31890	1,3	-	EA	-
B	1-12-67	32620	2	2	EA	-
C	2-2-67	32882	All	All	EA	-
D	9-6-67	34560	1	-	EA	-
E	10-5-67	34800	1,2	-	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 2 applies to Indicator Control panel 2021290 only.

2. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF then to ZERO for a minimum of 20 seconds and return to OFF
b. OPTICS TEL TRUN to SLAVE TO SXT
c. OPTICS COUPLING to DIRECT
d. OPTICS MODE to MAN
e. OPTICS SPEED to HI

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ZERO OPTICS TEST

JDC 12212 REV E PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Step 2A applies to all Indicator Control panels except 2021290.

2A. Set switches on Indicator Control panel as follows:

a. OPTICS MODE to MAN then to ZERO for a minimum of 20 seconds and return to MAN
b. OPTICS CONTROLLER SPEED to HI
c. OPTICS CONTROLLER COUPLING to DIRECT
d. OPTICS TRACKER to OFF
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. ∮1 on Oscilloscope A.

4. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller.

NOTE: Step 5 applies to Indicator Control panel 2021290 only.

5. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 5A applies all Indicator Control panels except 2021290.

5A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. ∮1 on Oscilloscope A.

7. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller.

OPTICS TIME TO ZERO

8. Insure that the CH 5 AC pushbutton on the Oscillograph Signal Selector panel is lighted.

9. Set CHANNEL 1 switch to 13 and CHANNEL 5 switch to 11 to monitor the following signal outputs:

a. SCT Shaft MDA Tach Mon. voltage on CHANNEL 1.
b. SCT Trunnion MDA Tach Mon. voltage on CHANNEL 5.

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JOB ZERO OPTICS TEST

JDC 12212 REV E PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Step 10 applies to Indicator Control panel 2021290 only.

10. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to CMC.

NOTE: Step 10A applies to all Indicator Control panels except 2021290.

10A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to CMC.

11. Perform the following DSKY operations:

VERB 41	NOUN 55	ENTR
+27000		ENTR
+75000		ENTR

Wait until optics stop driving before proceeding.

12. Press the CHART SPEEDS 10 pushbutton on the Oscillograph Control panel and set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 100 MV/MM
b. CHANNEL 5 to 100 MV/MM

13. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and note that steady state signals appear on the Oscillograph chart.

NOTE: Step 14 applies to Indicator Control panel 2021290.

14. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 14A applies to all Indicator Control panels except 2021290.

14A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

15. When all signals reach steady state values, perform the following DSKY operations:

VERB 06	NOUN 55	ENTR

Record DSKY Row 1 and Row 2 indications. Wait approximately 5 seconds and set the CHART DRIVE switch on the Oscillograph Control panel to OFF. Set all sensitivities on the Oscillograph Amplifier to OFF.

16. Record the elapsed time between the steady state nulls on the Oscillograph chart for CHANNELS 1 and 5.

17. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and in-phase voltage of the following signals on the PAVM:

a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.
b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

NO. 12212 JDC
REV. E
INITIAL TDRR 29882

JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	SCT Trunnion MDA Output	v p-p	5		15		
7	SCT Shaft MDA Output Mon.	v p-p	10		25		
15	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
16	SCT Shaft Time to Zero (CH 1)	sec	0		15		
	SCT Trunnion Time to Zero (CH 5)	sec	0		15		
17	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12212
REV. E

JOB ZERO OPTICS TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17 (cont)	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

FORM 0155
New 5-[illegible]

JOB ZERO OPTICS TEST

JDC 12212 REV. F PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates optics time to zero and CDU zeroing accuracy. Telemetry input signals, and PSA test points are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31890	1,3	-	EA	-
B	1-12-67	32620	2	2	EA	-
C	2-2-67	32882	All	All	EA	-
D	9-6-67	34560	1	-	EA	-
E	10-5-67	34800	1,2	-	EA	-
F	10-26-67	34935	3	-	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 2 applies to Indicator Control panel 2021290 only.

2. Set switches on Indicator Control panel as follows:

- a. OPTICS ZERO to OFF then to ZERO for a minimum of 20 seconds and return to OFF
- b. OPTICS TEL TRUN to SLAVE TO SXT
- c. OPTICS COUPLING to DIRECT
- d. OPTICS MODE to MAN
- e. OPTICS SPEED to HI

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ZERO OPTICS TEST

JDC 12212 REV F PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Step 2A applies to all Indicator Control panels except 2021290.

2A. Set switches on Indicator Control panel as follows:

- a. OPTICS MODE to MAN then to ZERO for a minimum of 20 seconds and return to MAN
- b. OPTICS CONTROLLER SPEED to HI
- c. OPTICS CONTROLLER COUPLING to DIRECT
- d. OPTICS TRACKER to OFF
- e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. ∅1 on Oscilloscope A.

4. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller.

NOTE: Step 5 applies to Indicator Control panel 2021290 only.

5. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 5A applies all Indicator Control panels except 2021290.

5A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. ∅1 on Oscilloscope A.

7. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller.

OPTICS TIME TO ZERO

8. Insure that the CH 5 AC pushbutton on the Oscillograph Signal Selector panel is lighted.

9. Set CHANNEL 1 switch to 13 and CHANNEL 5 switch to 11 to monitor the following signal outputs:

- a. SCT Shaft MDA Tach Mon. voltage on CHANNEL 1.
- b. SCT Trunnion MDA Tach Mon. voltage on CHANNEL 5.

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JOB ZERO OPTICS TEST

JDC 12212 REV F PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

10. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and set sensitivities on Oscillograph Amplifier panel as follows:

- a. CHANNEL 1 to 100 MV/MM
- b. CHANNEL 5 to 100 MV/MM

NOTE: Step 11 applies to Indicator Control panel 2021290 only.

11. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 11A applies to all Indicator Control panels except 2021290.

11A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

12. With the Optics Hand Controller in upper left quadrant, drive the SXT until the TPAC indicates 180° ±1° shaft angle and 75° ±1° trunnion angle.

13. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and note that steady state signals appear on the Oscillograph chart.

NOTE: Step 14 applies to Indicator Control panel 2021290.

14. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 14A applies to all Indicator Control panels except 2021290.

14A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

15. When all signals reach steady state values, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record DSKY Row 1 and Row 2 indications. Wait approximately 5 seconds and set the CHART DRIVE switch on the Oscillograph Control panel to OFF. Set all sensitivities on the Oscillograph Amplifier to OFF.

16. Record the elapsed time between the steady state nulls on the Oscillograph chart for CHANNELS 1 and 5.

17. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and in-phase voltage of the following signals on the PAVM:

- a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.
- b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 61

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12212
REV. F
INITIAL TDRR 29882

JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE

NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	SCT Trunnion MDA Output	v p-p	5		15		
7	SCT Shaft MDA Output Mon.	v p-p	10		25		
15	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
16	SCT Shaft Time to Zero (CH 1)	sec	0		15		
	SCT Trunnion Time to Zero (CH 5)	sec	0		15		
17	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12212
REV. F

JOB ZERO OPTICS TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17 (cont)	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

FORM 1015
New 1-10-65

JOB ZERO OPTICS TEST | JDC 12212 REV. G PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The test demonstrates optics time to zero and CDU zeroing accuracy. Telemetry input signals, and PSA test points are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31890	1,3	-	EA	-
B	1-12-67	32620	2	2	EA	-
C	2-2-67	32882	All	All	EA	-
D	9-6-67	34560	1	-	EA	-
E	10-5-67	34800	1,2	-	EA	-
F	10-26-67	34935	3	-	EA	-
G	1-11-68	35384	-	1	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 2 applies to Indicator Control panel 2021290 only.

2. Set switches on Indicator Control panel as follows:

- a. OPTICS ZERO to OFF then to ZERO for a minimum of 20 seconds and return to OFF
- b. OPTICS TEL TRUN to SLAVE TO SXT
- c. OPTICS COUPLING to DIRECT
- d. OPTICS MODE to MAN
- e. OPTICS SPEED to HI

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ZERO OPTICS TEST | JDC 12212 REV G PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

NOTE: Step 2A applies to all Indicator Control panels except 2021290.

2A. Set switches on Indicator Control panel as follows:

- a. OPTICS MODE to MAN then to ZERO for a minimum of 20 seconds and return to MAN
- b. OPTICS CONTROLLER SPEED to HI
- c. OPTICS CONTROLLER COUPLING to DIRECT
- d. OPTICS TRACKER to OFF
- e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. ∮1 on Oscilloscope A.

4. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller.

NOTE: Step 5 applies to Indicator Control panel 2021290 only.

5. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 5A applies all Indicator Control panels except 2021290.

5A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. ∮1 on Oscilloscope A.

7. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller.

OPTICS TIME TO ZERO

8. Insure that the CH 5 AC pushbutton on the Oscillograph Signal Selector panel is lighted.

9. Set CHANNEL 1 switch to 13 and CHANNEL 5 switch to 11 to monitor the following signal outputs:

- a. SCT Shaft MDA Tach Mon. voltage on CHANNEL 1.
- b. SCT Trunnion MDA Tach Mon. voltage on CHANNEL 5.

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JOB ZERO OPTICS TEST | JDC 12212 REV G PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

10. Press CHART SPEEDS 10 pushbutton on Oscillograph Control panel and set sensitivities on Oscillograph Amplifier panel as follows:

- a. CHANNEL 1 to 100 MV/MM
- b. CHANNEL 5 to 100 MV/MM

NOTE: Step 11 applies to Indicator Control panel 2021290 only.

11. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 11A applies to all Indicator Control panels except 2021290.

11A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

12. With the Optics Hand Controller in upper left quadrant, drive the SXT until the TPAC indicates 180° ±1° shaft angle and 75° ±1° trunnion angle.

13. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and note that steady state signals appear on the Oscillograph chart.

NOTE: Step 14 applies to Indicator Control panel 2021290.

14. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 14A applies to all Indicator Control panels except 2021290.

14A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

15. When all signals reach steady state values, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record DSKY Row 1 and Row 2 indications. Wait approximately 5 seconds and set the CHART DRIVE switch on the Oscillograph Control panel to OFF. Set all sensitivities on the Oscillograph Amplifier to OFF.

16. Record the elapsed time between the steady state nulls on the Oscillograph chart for CHANNELS 1 and 5.

17. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and in-phase voltage of the following signals on the PAVM:

- a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.
- b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12212
REV. G
INITIAL TDRR 29882

JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	SCT Trunnion MDA Output	v p-p	5		15		
7	SCT Shaft MDA Output Mon.	v p-p	10		35		
15	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
16	SCT Shaft Time to Zero (CH 1)	sec	0		15		
	SCT Trunnion Time to Zero (CH 5)	sec	0		15		
17	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

FORM 00116
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12212
REV. G

JOB ZERO OPTICS TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
17 (cont)	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

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FORM 0115
New 9-30-65

JOB ZERO OPTICS TEST

JDC 12212 REV. H PAGE 1 OF 3

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates CDU zeroing accuracy. Telemetry input signals and PSA test points are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	11-10-66	31890	1,3	-	EA	-
B	1-12-67	32620	2	2	EA	-
C	2-2-67	32882	All	All	EA	-
D	9-6-67	34560	1	-	EA	-
E	10-6-67	34800	1,2	-	EA	-
F	10-26-67	34935	3	-	EA	-
G	1-11-68	35384	-	1	EA	-
H	4-25-68	36122	All	1	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 2 applies to Indicator Control panel 2021290 only.

2. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF then to ZERO for a minimum of 20 seconds and return to OFF
b. OPTICS TEL TRUN to SLAVE TO SXT
c. OPTICS COUPLING to DIRECT
d. OPTICS MODE to MAN
e. OPTICS SPEED to HI

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ZERO OPTICS TEST

JDC 12212 REV H PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: Step 2A applies to all Indicator Control panels except 2021290.

2A. Set switches on Indicator Control panel as follows:

a. OPTICS MODE to MAN then to ZERO for a minimum of 20 seconds and return to MAN
b. OPTICS CONTROLLER SPEED to HI
c. OPTICS CONTROLLER COUPLING to DIRECT
d. OPTICS TRACKER to OFF
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. #1 on Oscilloscope A.

4. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics Hand Controller to the upper limit not longer than 5 seconds. Release the Optics Hand Controller.

5. Deleted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. #1 on Oscilloscope A.

7. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller.

8 through 12. Deleted.

CDU ZEROING ACCURACY

13. Using the Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 14 applies to Indicator Control panel 2021290.

14. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 14A applies to all Indicator Control panels except 2021290.

14A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

15. When all signals reach steady state values, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record DSKY Row 1 and Row 2 indications.

16. Deleted.

17. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and in-phase voltage of the following signals on the PAVM:

a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.

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JOB ZERO OPTICS TEST

JDC 12212 REV H PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12212
REV H
INITIAL TDRR 29882

JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE

NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	SCT Trunnion MDA Output	v p-p	5		15		
7	SCT Shaft MDA Output Mon.	v p-p	10		35		
15	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
17	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		
	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

DATE 30 JUN 66

JOB ZERO OPTICS TEST

JDC 12212 REV. J PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates CDU zeroing accuracy. Telemetry input signals and PSA test points are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31890	1,3	-	EA	-
B	1-12-67	32620	2	2	EA	-
C	2-2-67	32882	All	All	EA	-
D	9-6-67	34560	1	-	EA	-
E	10-5-67	34800	1,2	-	EA	-
F	10-26-67	34935	3	-	EA	-
G	1-11-68	35384	-	1	EA	-
H	4-25-68	36122	All	1	EA	-
J	10-21-68	36931	1	-	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: If TRACKER alarm occurs during performance of step 2, press RSET pushbutton on DSKY to extinguish alarm.

NOTE: Step 2 applies to Indicator Control panel 2021290 only.

2. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF then to ZERO for

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB ZERO OPTICS TEST

JDC 12212 REV J PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

a minimum of 20 seconds and return to OFF

b. OPTICS TEL TRUN to SLAVE TO SXT

c. OPTICS COUPLING to DIRECT

d. OPTICS MODE to MAN

e. OPTICS SPEED to HI

NOTE: Step 2A applies to all Indicator Control panels except 2021290.

2A. Set switches on Indicator Control panel as follows:

a. OPTICS MODE to MAN then to ZERO for a minimum of 20 seconds and return to MAN

b. OPTICS CONTROLLER SPEED to HI

c. OPTICS CONTROLLER COUPLING to DIRECT

d. OPTICS TRACKER to OFF

e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. ∅1 on Oscilloscope A.

4. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics Hand Controller to the upper limit not longer than 5 seconds. Release the Optics Hand Controller.

5. Deleted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. ∅1 on Oscilloscope A.

7. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller.

8 through 12. Deleted.

CDU ZEROING ACCURACY

13. Using the Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 14 applies to Indicator Control panel 2021290.

14. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 14A applies to all Indicator Control panels except 2021290.

14A. Set OPTICS MODE switch on indicator Control panel to ZERO.

15. When all signals reach steady state values, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record DSKY Row 1 and Row 2 indications.

16. Deleted.

17. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and in-phase voltage of the following signals

DATE 30 JUN 66

JOB ZERO OPTICS TEST

JDC 12212 REV J PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

on the PAVM:

a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.

b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

18. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12212
REV J
INITIAL TDRR 29882

JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	SCT Trunnion MDA Output	v p-p	5		15		
7	SCT Shaft MDA Output Mon.	v p-p	10		35		
15	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
17	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		
	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

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JOB ZERO OPTICS TEST

JDC 12212 REV. - PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The test demonstrates optics time to zero and CDU zeroing accuracy. Telemetry input signals, and PSA test points are also checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	PS-2015000
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

NOTE: 1. The Oscillograph sensitivities called out in this JDC are nominal values. Operator may change sensitivities as required.

2. The range of amplitude for some signals monitored on the Oscillograph in this JDC may require that the pen be offset from the normal center line for the zeroing position. The operator may offset pens for zeroing as required.

TEST POINT QUALIFICATION

1. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

2. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT SHAFT angle is displayed on Row 1.

c. Observe SXT TRN LOS angle is displayed on Row 2.

3. Set the CONTROLLER COUPLING switch to DIRECT, the CONTROLLER SPEED switch to HI and the OPTICS MODE switch to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB ZERO OPTICS TEST

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SUBSYSTEM G & N SYSTEM

ASSY

4. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 202 to monitor the SCT Trunnion MDA Output Mon. ø1 on Oscilloscope A.

5. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand controller.

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After 20 seconds, set the OPTICS MODE switch to MAN.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 110 to monitor the SCT Shaft MDA Output MON. ø 1 on Oscilloscope A.

8. Measure and record the steady-state peak-to-peak voltage indicated on the Oscilloscope after the initial acceleration transient while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set the OPTICS MODE switch on the Indicator Control panel to ZERO.

OPTICS TIME TO ZERO

9. Insure that the CH 5 AC pushbutton on the Oscillograph Signal Selector panel is lighted.

10. Set CHANNEL 1 switch to 13 and CHANNEL 5 switch to 11 to monitor the following signal outputs:

a. SCT Shaft MDA Tach Mon. voltage on CHANNEL 1.

b. SCT Trunnion MDA Tach Mon. voltage on CHANNEL 5.

11. Set the OPTICS MODE switch on the Indicator Control panel to MAN.

12. Set the CONTROLLER SPEED switch to LO. Using the Optics hand controller, drive the optics increasing to the position where the DSKY Row 1 indicates +27000 and Row 2 indicates +75000.

13. Press the CHART SPEEDS 10 pushbutton on the Oscillograph Control panel and set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 100 MV/MM

b. CHANNEL 5 to 100 MV/MM

14. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and note that steady state signals appear on the Oscillograph chart.

15. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

16. When all signals reach steady state values, record DSKY Row 1 and Row 2 indications. Wait approximately 5 seconds and set the CHART DRIVE switch on the Oscillograph Control panel to OFF. Set all sensitivities on the Oscillograph Amplifier to OFF.

DATE ________

JOB ZERO OPTICS TEST

JDC 12212 REV - PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM

ASSY

17. Record the elapsed time between the steady state nulls on the Oscillograph chart for CHANNELS 1 and 5.

18. Set the VOLTMETER INPUT PAVM switch on the Primary Signal Selector panel to SIG 2. Set the CROSSBAR CONTROL to the positions below and measure the total and inphase voltage of the following signals on the PAVM:

a. Trunnion Fine Error with the CROSSBAR CONTROL set to 06.

b. Shaft Fine Error with the CROSSBAR CONTROL set to 05.

DATE ________

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EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12212
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JOB ZERO OPTICS TEST

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ________ DWG ________ REV. ________

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE

NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION

APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	SCT Trunnion MDA Output	v p-p	5		15		
8	SCT Shaft MDA Output Mon.	v p-p	10		25		
16	DSKY Row 1 Display (Shaft angle)	deg	-00003		+00002		
	DSKY Row 2 Display (Trunnion angle)	deg	-00007		+00006		
17	SCT Shaft Time to Zero (CH 1)	sec	0		15		
	SCT Trunnion Time to Zero (CH 5)	sec	0		15		
18	TRUNNION Fine Error (Total null)	v rms	0.0		0.1		
	TRUNNION Fine Error (In phase null)	v rms	0.0		0.08		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
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JOB ZERO OPTICS TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19 (cont)	SHAFT Fine Error (Total null)	v rms	0.0		0.10		
	SHAFT Fine Error (In phase null)	v rms	0.0		0.08		

DATE ______

JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G AND N SYSTEM

ASSY:

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: OSCILLOGRAPH AMPLIFIER sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Establish a Master Initialization condition.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE and OPT 800 ~ PH GEN pushbuttons on oscillograph signal selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph signal selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT SHAFT ANGLE Displayed on Row 1.

c. Observe SXT TRN LOS Angle Displayed Row 2.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM G AND N SYSTEM ASSY

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after DSKY displays all zeroes on Row 1 and Row 2, set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 to 13 on the Oscillograph signal selector panel to monitor the following signals:

a. SCT Shaft MDA Tach Mon. on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

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JOB OPTICS SLEW RATE TEST JDC 12213 REV A PAGE 3 OF 6

SUBSYSTEM G AND N SYSTEM ASSY

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control to MM/SEC.

21. Hold the Optics hand controller to the left limit not longer than 10 seconds. Release the Optics hand controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEED 20 pushbutton on the Oscillograph control panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the right limit not longer than 20 seconds. Release the Optics hand controller.

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SUBSYSTEM G AND N SYSTEM ASSY

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the left limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 4 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 4 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics hand controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

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46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Release the Optics hand controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch to 12 and the CHANNEL 6 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Shaft MDA Tach Mon on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 6 sensitivity to 2 MV/MM on the Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics hand controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on Row 1 of DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics hand controller.

57. Set all sensitivities on Oscillograph Amplifier to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5

MV/MM and set the CHART DRIVE switch on the Oscillograph control panel to MM/SEC.

60. Hold Optics hand controller to left limit until SXT is against shaft stop as indicated by a nominal (unchanging) value of -270° on Row 1 of DSKY. Release Optics hand controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 SENSITIVITY control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the indicator control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the Telescope Trunnion switch is in the SLAVE to SXT position.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

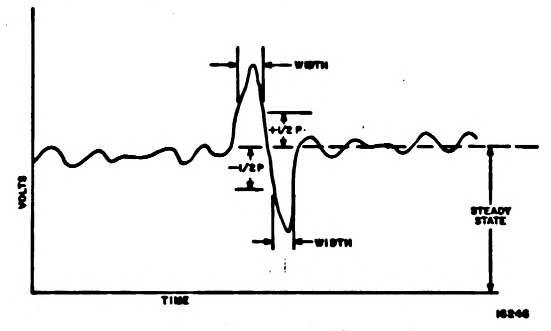

Figure 1. Signal Characteristics Diagram

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EQUIPMENT TEST
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JDC
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REV. A
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION   APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12213
REV. A

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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EQUIPMENT TEST
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JDC
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
DATA SHEET 4 OF 4

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 **D.S. PGS** 4

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

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			JDC	D.S.	MIT	NASA
Ⓜ A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: OSCILLOGRAPH AMPLIFIER sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Establish a Master Initialization condition and press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on oscillograph signal selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph signal selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:
   a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.
   b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Perform the following DSKY operations:
   a. VERB 16 NOUN 55 ENTR
   b. Observe SXT SHAFT ANGLE Displayed on Row 1.
   c. Observe SXT TRN LOS Angle Displayed Row 2.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM G AND N SYSTEM **ASSY**

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after DSKY displays all zeroes on Row 1 and Row 2, set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 to 13 on the Oscillograph signal selector panel to monitor the following signals:
   a. SCT Shaft MDA Tach Mon. on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

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JOB OPTICS SLEW RATE TEST **JDC** 12213 **REV** B **PAGE** 3 **OF** 6

SUBSYSTEM G AND N SYSTEM **ASSY**

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control to MM/SEC.

21. Hold the Optics hand controller to the left limit not longer than 10 seconds. Release the Optics hand controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEED 20 pushbutton on the Oscillograph control panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the right limit not longer than 20 seconds. Release the Optics hand controller.

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SUBSYSTEM G AND N SYSTEM **ASSY**

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the left limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 4 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 4 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:
   a. SXT Trun MDA Tach Mon. on CHANNEL 2.
   b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics hand controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

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46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Release the Optics hand controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch to 12 and the CHANNEL 6 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Shaft MDA Tach Mon on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 6 sensitivity to 2 MV/MM on the Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics hand controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on Row 1 of DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics hand controller.

57. Set all sensitivities on Oscillograph Amplifier to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5

MV/MM and set the CHART DRIVE switch on the Oscillograph control panel to MM/SEC.

60. Hold Optics hand controller to left limit until SXT is against shaft stop as indicated by a nominal (unchanging) value of -270° on Row 1 of DSKY. Release Optics hand controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 SENSITIVITY control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the indicator control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the Telescope Trunnion switch is in the SLAVE to SXT position.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

64. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

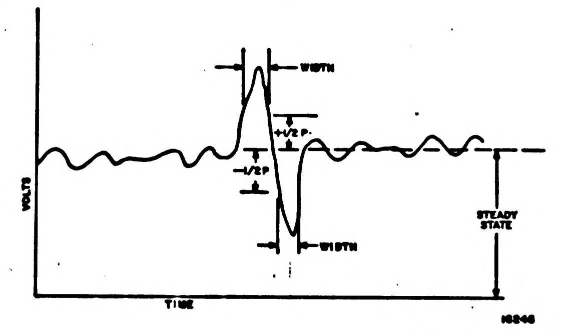

Figure 1. Signal Characteristics Diagram

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JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12213
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 D.S. PGS. 4

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30305	2-5	3, 4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: OSCILLOGRAPH AMPLIFIER sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Establish a Master Initialization condition (JDC 12215) and press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on oscillograph signal selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on P&A Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph signal selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT SHAFT ANGLE Displayed on Row 1.

c. Observe SXT TRN LOS Angle Displayed Row 2.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after DSKY displays all zeroes on Row 1 and Row 2, set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 to 13 on the Oscillograph signal selector panel to monitor the following signals:

a. SCT Shaft MDA Tach Mon. on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control to MM/SEC.

21. Hold the Optics hand controller to the left limit not longer than 10 seconds. Release the Optics hand controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEED 20 pushbutton on the Oscillograph control panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the right limit not longer than 20 seconds. Release the Optics hand controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA Tach Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the left limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 4 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 4 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics hand controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Release the Optics hand controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch to 12 and the CHANNEL 6 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Shaft MDA Tach Mon on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 6 sensitivity to 2 MV/MM on the Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics hand controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on Row 1 of DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics hand controller.

57. Set all sensitivities on Oscillograph Amplifier to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5

MV/MM and set the CHART DRIVE switch on the Oscillograph control panel to MM/SEC.

60. Hold Optics hand controller to left limit until SXT is against shaft stop as indicated by Row 1 of DSKY displaying (unchanging) value of approximately +90°. Release Optics hand controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 SENSITIVITY control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the indicator control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the Telescope Trunnion switch is in the SLAVE to SXT position.

	Signal	CROSSBAR CONTROL
a.	SCT Trun MDA P/A Mon.	103
b.	SXT Shaft MDA P/A Mon.	203
c.	SXT Trun MDA P/A Mon.	106
d.	SCT Shaft MDA P/A Mon.	210

64. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

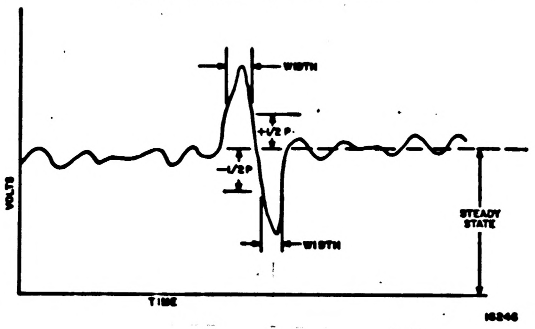

Figure 1. Signal Characteristics Diagram

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EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12213
REV. C
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE ___ START ___ END ___ SITE / LOCATION
SER. NO. ___ DWG ___ REV. ___	TIME ___ START ___ END ___ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ___ SER. NO. ___ CAL DATE
NAME ___ SER. NO. ___ CAL DATE

CONDUCTED BY ___ NAME/AFFILIATION APPROVED BY ___ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12213
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12213
REV. C

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
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JDC
NO. 12213
REV. C

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST

JDC 12213 **REV.** D **PAGE** 1 **OF** 6
INITIAL TDRR 29882 **D.S. PGS** 4

SUBSYSTEM G AND N SYSTEM
ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1,4	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

* NOTE: OSCILLOGRAPH AMPLIFIER sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on oscillograph signal selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph signal selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT SHAFT ANGLE Displayed on Row 1.

c. Observe SXT TRN LOS Angle Displayed Row 2.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after DSKY displays all zeroes on Row 1 and Row 2, set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 to 13 on the Oscillograph signal selector panel to monitor the following signals:

a. SCT Shaft MDA Tach Mon. on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

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19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control to MM/SEC.

21. Hold the Optics hand controller to the left limit not longer than 10 seconds. Release the Optics hand controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEED 20 pushbutton on the Oscillograph control panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the right limit not longer than 20 seconds. Release the Optics hand controller.

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34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the left limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics hand controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 **D.S. PGS** 4

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1,4	-	EA	-

REFERENCES
PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

* NOTE: OSCILLOGRAPH AMPLIFIER sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on oscillograph signal selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph signal selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT SHAFT ANGLE Displayed on Row 1.

c. Observe SXT TRN LOS Angle Displayed Row 2.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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Clg. 3-18-66

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6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after DSKY displays all zeroes on Row 1 and Row 2, set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 to 13 on the Oscillograph signal selector panel to monitor the following signals:

a. SCT Shaft MDA Tach Mon. on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

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19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control to MM/SEC.

21. Hold the Optics hand controller to the left limit not longer than 10 seconds. Release the Optics hand controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEED 20 pushbutton on the Oscillograph control panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the right limit not longer than 20 seconds. Release the Optics hand controller.

---

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA Tach Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the left limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics hand controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

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SUBSYSTEM G AND N SYSTEM | ASSY

46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Release the Optics hand controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch to 12 and the CHANNEL 6 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Shaft MDA Tach Mon on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 6 sensitivity to 2 MV/MM on the Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics hand controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on Row 1 of DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics hand controller.

57. Set all sensitivities on Oscillograph Amplifier to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5

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SUBSYSTEM G AND N SYSTEM | ASSY

MV/MM and set the CHART DRIVE switch on the Oscillograph control panel to MM/SEC.

60. Hold Optics hand controller to left limit until SXT is against shaft stop as indicated by Row 1 of DSKY displaying (unchanging) value of approximately +90°. Release Optics hand controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 SENSITIVITY control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the indicator control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the Telescope Trunnion switch is in the SLAVE to SXT position.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

64. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

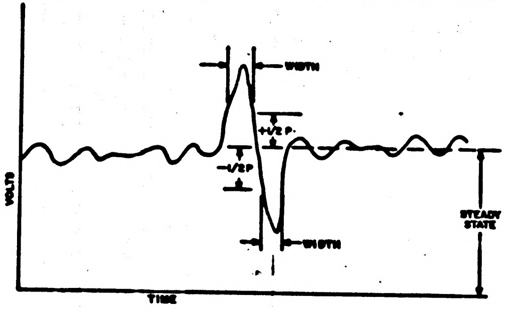

Figure 1. Signal Characteristics Diagram

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JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m.sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M.sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN TACH MON PULSE WIDTH	m.sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m.sec.	▨		250		

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46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Release the Optics hand controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch to 12 and the CHANNEL 6 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Shaft MDA Tach Mon on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 6 sensitivity to 2 MV/MM on the Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics hand controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on Row 1 of DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics hand controller.

57. Set all sensitivities on Oscillograph Amplifier to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5 MV/MM and set the CHART DRIVE switch on the Oscillograph control panel to MM/SEC.

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60. Hold Optics hand controller to left limit until SXT is against shaft stop as indicated by Row 1 of DSKY displaying (unchanging) value of approximately +90°. Release Optics hand controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 SENSITIVITY control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the indicator control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the Telescope Trunnion switch is in the SLAVE to SXT position.

	Signal	CROSSBAR CONTROL
a.	SCT Trun MDA P/A Mon.	103
b.	SXT Shaft MDA P/A Mon.	203
c.	SXT Trun MDA P/A Mon.	106
d.	SCT Shaft MDA P/A Mon.	210

64. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

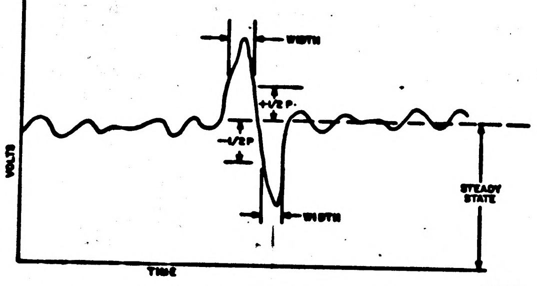

Figure 1. Signal Characteristics Diagram

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EQUIPMENT TEST
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NO. 12213 JDC
REV. D
INITIAL TDRR 23832

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ______ CAL DATE
NAME ________ SER. NO. ______ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
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NO. 12213
REV. D

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JDC
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST
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INITIAL TDRR 29882 D.S. PGS 4
SUBSYSTEM G AND N SYSTEM
ASSY.
DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1,6	-	EA	-
D	1-12-67	32621	1,4	-	EA	-
E	2-2-67	32883	All	2	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Deleted

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SUBSYSTEM G AND N SYSTEM
ASSY

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after approximately 20 seconds set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 13 and monitor SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

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JOB OPTICS SLEW RATE TEST
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SUBSYSTEM G AND N SYSTEM
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19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold the Optics Hand Controller to the left limit not longer than 10 seconds. Release the Optics Hand Controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

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34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics Hand Controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

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INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G AND N SYSTEM | ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Deleted

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM G AND N SYSTEM | ASSY

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after approximately 20 seconds set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 13 and monitor SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

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SUBSYSTEM G AND N SYSTEM | ASSY

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold the Optics Hand Controller to the left limit not longer than 10 seconds. Release the Optics Hand Controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

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SUBSYSTEM G AND N SYSTEM | ASSY

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics Hand Controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

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46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Release the Optics Hand Controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 and monitor SXT Shaft MDA Tach Mon signal on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM and set CHART DRIVE to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

57. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5

MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

60. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the TELESCOPE TRUNNION switch is in the SLAVE to SXT position.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

64. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

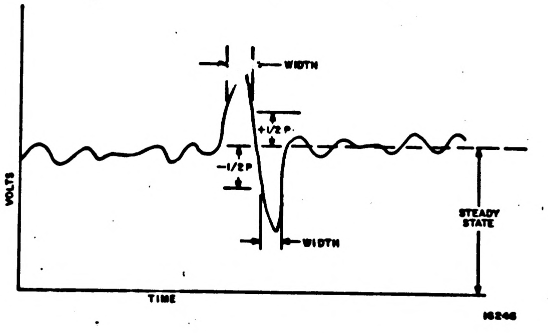

Figure 1. Signal Characteristics Diagram

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12213
REV. E
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ____________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ________ CAL DATE
NAME ____________ SER. NO. ________ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12213
REV. E

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Release the Optics Hand Controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 and monitor SXT Shaft MDA Tach Mon signal on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM and set CHART DRIVE to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

57. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5

DATE 30 JUN 66

MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

60. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the TELESCOPE TRUNNION switch is in the SLAVE to SXT position.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

64. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

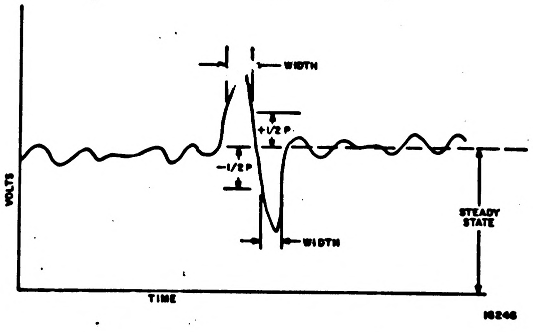

Figure 1. Signal Characteristics Diagram

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4
JOB OPTICS SLEW RATE TEST

JDC
NO. 12213
REV. E
INITIAL TDRR 29812

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4
JOB OPTICS SLEW RATE TEST

JDC
NO. 12213
REV. E

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12213
REV. E

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12213
REV. E

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12213
REV. E

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12213
REV. E

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST | JDC 12213 REV. F PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G AND N SYSTEM | ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, C	-	EA	-
C	11-15-66	31942	1,6	-	EA	-
D	1-12-67	32621	1,4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Deleted

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPTICS SLEW RATE TEST | JDC 12213 REV F PAGE 2 OF 6

SUBSYSTEM G AND N SYSTEM | ASSY

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after approximately 20 seconds set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 13 and monitor SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

DATE 30 JUN 66

JOB OPTICS SLEW RATE TEST | JDC 12213 REV F PAGE 3 OF 6

SUBSYSTEM G AND N SYSTEM | ASSY

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold the Optics Hand Controller to the left limit not longer than 10 seconds. Release the Optics Hand Controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 08 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

DATE 30 JUN 66

JOB OPTICS SLEW RATE TEST | JDC 12213 REV F PAGE 4 OF 6

SUBSYSTEM G AND N SYSTEM | ASSY

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics Hand Controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

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46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Release the Optics Hand Controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 and monitor SXT Shaft MDA Tach Mon signal on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM and set CHART DRIVE to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

57. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5

MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

60. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the TELESCOPE TRUNNION switch is in the SLAVE to SXT position.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

64. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

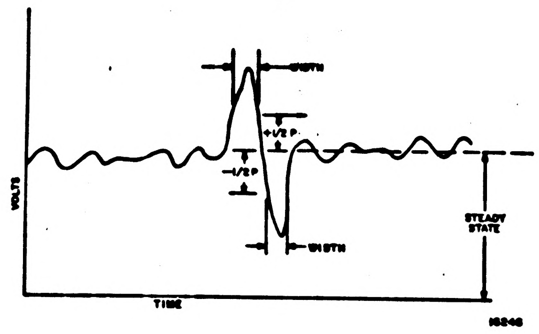

Figure 1. Signal Characteristics Diagram

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4
JOB OPTICS SLEW RATE TEST

JDC
NO. 12213
REV. F
INITIAL TDRR 29983

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION ______
TIME ______ START ______ END ______ TOTAL ELAPSED ______

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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EQUIPMENT TEST
DATA SHEET 2 OF 4
JOB OPTICS SLEW RATE TEST

JDC
NO. 12213
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12213
REV. F

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 D.S PGS 4

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	7-28-66	30305	2-5	3,4	EA	WS	PS-2015000
B	11-10-66	31891	1, 6	-	EA	-	
C	11-15-66	31942	1, 6	-	EA	-	IMPORTANT
D	1-12-67	32621	1, 4	-	EA	-	
E	2-2-67	32883	All	2	EA	-	
F	3-2-67	33103	-	2	EA	-	INTERVAL
G	5-4-67	33719	-	3	EA	-	
							TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Deleted

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after approximately 20 seconds set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 13 and monitor SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

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19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold the Optics Hand Controller to the left limit not longer than 10 seconds. Release the Optics Hand Controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

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34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on Row 2 of the DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics Hand Controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Release the Optics Hand Controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 and monitor SXT Shaft MDA Tach Mon signal on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM and set CHART DRIVE to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

57. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5

MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

60. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the TELESCOPE TRUNNION switch is in the SLAVE to SXT position.

	Signal	CROSSBAR CONTROL
a.	SCT Trun MDA P/A Mon.	103
b.	SXT Shaft MDA P/A Mon.	203
c.	SXT Trun MDA P/A Mon.	106
d.	SCT Shaft MDA P/A Mon.	210

64. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

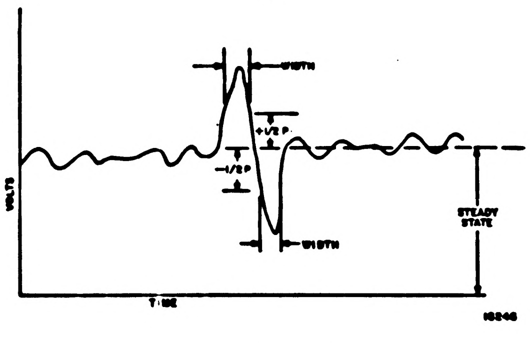

Figure 1, Signal Characteristics Diagram

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EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12213
REV. G
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

FORM 60146
Chg -23-65

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EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12213
REV G

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12213
REV. G

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JDC
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Deleted

VERIFICATION WITH SIDL REQUIRED BEFORE USE

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after approximately 20 seconds set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 13 and monitor SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold the Optics Hand Controller to the left limit not longer than 10 seconds. Release the Optics Hand Controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics Hand Controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Release the Optics Hand Controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 and monitor SXT Shaft MDA Tach Mon signal on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM and set CHART DRIVE to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

57. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5 MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

60. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the TELESCOPE TRUNNION switch is in the SLAVE to SXT position.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

64. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

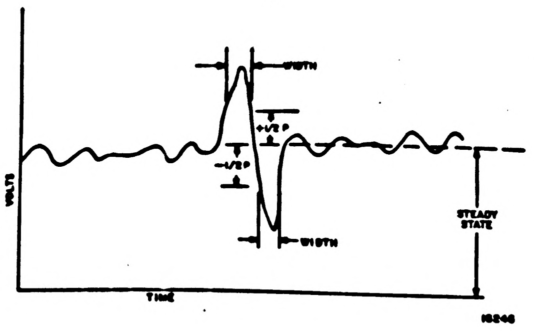

Figure 1. Signal Characteristics Diagram

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12213
REV. H
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12213
REV H

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12213
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12213
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 **D.S. PGS** 4

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-

REFERENCES

PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Deleted

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPTICS SLEW RATE TEST **JDC** 12213 **REV** J **PAGE** 2 **OF** 6

SUBSYSTEM G AND N SYSTEM **ASSY**

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after approximately 20 seconds set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 13 and monitor SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

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JOB OPTICS SLEW RATE TEST **JDC** 12213 **REV** J **PAGE** 3 **OF** 6

SUBSYSTEM G AND N SYSTEM **ASSY**

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold the Optics Hand Controller to the left limit not longer than 10 seconds. Release the Optics Hand Controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

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SUBSYSTEM G AND N SYSTEM **ASSY**

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

43. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to lower limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics Hand Controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

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46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Release the Optics Hand Controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 and monitor SXT Shaft MDA Tach Mon signal on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM and set CHART DRIVE to MM/SEC.

54. Insure that 20 seconds have elapsed since step 50, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

57. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5

MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

60. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the TELESCOPE TRUNNION switch is in the SLAVE to SXT position.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

64. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

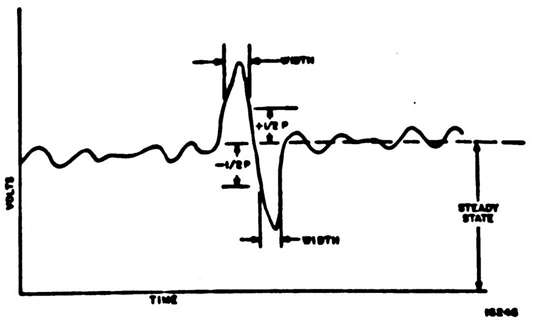

Figure 1. Signal Characteristics Diagram

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EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12213
REV. J
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
.11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

FORM 00146
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12213
REV J

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 4

JDC
NO. 12213
REV. J

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
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JDC
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST | JDC 12213 REV. K PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G AND N SYSTEM | ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2,3,4	EA	-

REFERENCES
PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall light.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800~ 0 PH REFERENCE and OPT 800~ PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Deleted

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after approximately 20 seconds set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 13 and monitor SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. Insure that 20 seconds have elapsed since step 12 and set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

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19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold the Optics Hand Controller to the left limit not longer than 10 seconds. Release the Optics Hand Controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and insuring that 20 seconds have elapsed since step 21, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. Insure that 20 seconds have elapsed since step 30. Set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

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34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

40. Insure that 20 seconds have elapsed since step 38, then set OPTICS MODE switch on the Indicator Control panel to MAN.

41. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC.

42. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics Hand Controller.

43. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2

b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any

pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

48. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

49. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 and monitor SXT Shaft MDA Tach Mon signal on CHANNEL 1.

50. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

51. Set CHANNEL 1 sensitivity on the Oscillograph Amplifier panel to 10 MV/MM and set CHART DRIVE to MM/SEC.

52. Insure that 20 seconds have elapsed since step 48, then set the OPTICS MODE switch on the Indicator Control panel to MAN.

53. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

54. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

55. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

56. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

57. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5 MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

58. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

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60. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

61. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 60. Insure that the TELESCOPE TRUNNION switch is in the SLAVE to SXT position.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

62. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

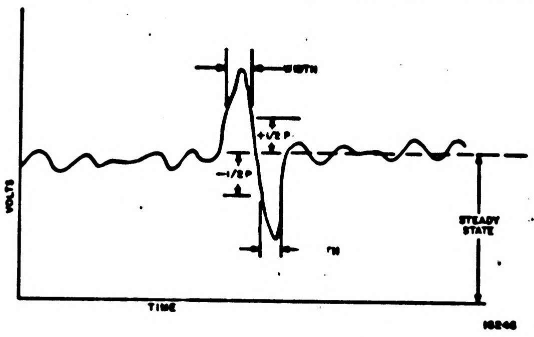

Figure 1. Signal Characteristics Diagram

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EQUIPMENT TEST
DATA SHEET 1 OF 3
JOB OPTICS SLEW RATE TEST

JDC
NO. 12213
REV. K
INITIAL TDRR 29882

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION
APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3
JOB OPTICS SLEW RATE TEST

JDC
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REV. J

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	0.02		0.1		
42	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
46	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
47	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
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REV. K

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
54	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
55	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

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			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2, 3, 4	EA	-
L	10-5-67	34806			EA	-

REFERENCES PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies to Indicator Control panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF

b. OPTICS TEL TRUN to SLAVE TO SXT

c. OPTICS COUPLING to DIRECT

d. OPTICS MODE to MAN

e. OPTICS SPEED to HI

NOTE: Step 3A applies to all Indicator Control panels except 2021290.

3A. Set switches on Indicator Control panel as follows:

a. OPTICS MODE to MAN

b. OPTICS CONTROLLER SPEED to HI

c. OPTICS CONTROLLER COUPLING to DIRECT

d. OPTICS TRACKER to OFF

e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO

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SUBSYSTEM G AND N SYSTEM

ASSY

PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to Indicator Control panel 2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to all Indicator Control panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

NOTE: Step 15 applies to Indicator Control panel 2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

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SUBSYSTEM G AND N SYSTEM

ASSY

NOTE: Step 15A applies to all Indicator Control panels except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to Indicator Control panel 2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to all Indicator Control panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

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SUBSYSTEM G AND N SYSTEM

ASSY

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to Indicator Control panel 2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to all Indicator Control panels except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Deleted.

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NOTE: Step 40 applies to Indicator Control panel 2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies to all Indicator Control panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the voltage indicated on the PAVM while holding Optics Hand Controller to the lower limit until SXT is against Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Continue holding Optics Hand Controller to lower limit.

42. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 06. Measure and record the SXT Trun MDA P/A voltage indicated on PAVM. Release Optics Hand Controller.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2

b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

50. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 10 MV/MM.

NOTE: Step 51 applies to Indicator Control panel 2021290 only.

51. Set OPTICS ZERO switch on Indicator Control Panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies to all Indicator Control panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

53. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

54. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

55. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

56. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

57. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5 MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

58. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

NOTE: Step 60 applies to Indicator Control panel 2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies to all Indicator Control panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

	Signal	CROSSBAR CONTROL
a.	SCT Trun MDA P/A Mon.	103
b.	SXT Shaft MDA P/A Mon.	203
c.	SXT Trun MDA P/A Mon.	106
d.	SCT Shaft MDA P/A Mon.	210

62. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

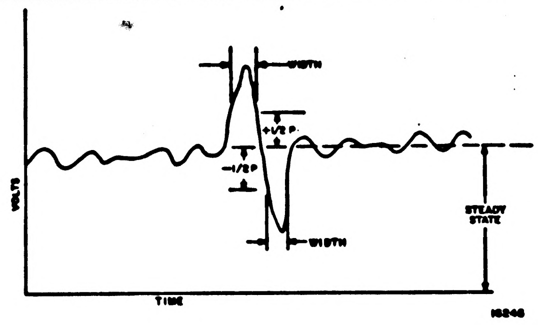

Figure 1. Signal Characteristics Diagram

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12213 JDC
REV. L
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE

NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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EQUIPMENT TEST
DATA SHEET 2 OF 3

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	0.02		0.1		
42	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
46	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
47	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
54	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
55	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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JOB OPTICS SLEW RATE TEST

JDC 12213 REV. M PAGE 1 OF 8
INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2, 3, 4	EA	-
L	10-5-67	34806			EA	-
M	12-7-67	35208	7, 8	4, 5	EA	-

REFERENCES
PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies to Indicator Control panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF
b. OPTICS TEL TRUN to SLAVE TO SXT
c. OPTICS COUPLING to DIRECT
d. OPTICS MODE to MAN
e. OPTICS SPEED to HI

NOTE: Step 3A applies to all Indicator Control panels except 2021290.

3A. Set switches on Indicator Control panel as follows:

a. OPTICS MODE to MAN
b. OPTICS CONTROLLER SPEED to HI
c. OPTICS CONTROLLER COUPLING to DIRECT
d. OPTICS TRACKER to OFF
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

ASSY

PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2
b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to Indicator Control panel 2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to all Indicator Control panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

NOTE: Step 15 applies to Indicator Control panel 2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

ASSY

NOTE: Step 15A applies to all Indicator Control panels except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to Indicator Control panel 2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to all Indicator Control panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

ASSY

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to Indicator Control panel 2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to all Indicator Control panels except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Deleted.

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NOTE: Step 40 applies to
Indicator Control panel
2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies
to all Indicator Control
panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the voltage indicated on the PAVM while holding Optics Hand Controller to the lower limit until SXT is against Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Continue holding Optics Hand Controller to lower limit.

42. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 06. Measure and record the SXT Trun MDA P/A voltage indicated on PAVM. Release Optics Hand Controller.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2

b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

50. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 10 MV/MM.

NOTE: Step 51 applies to
Indicator Control panel
2021290 only.

51. Set OPTICS ZERO switch on Indicator Control Panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies
to all Indicator Control
panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

53. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

54. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

55. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

56. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

57. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5 MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

58. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

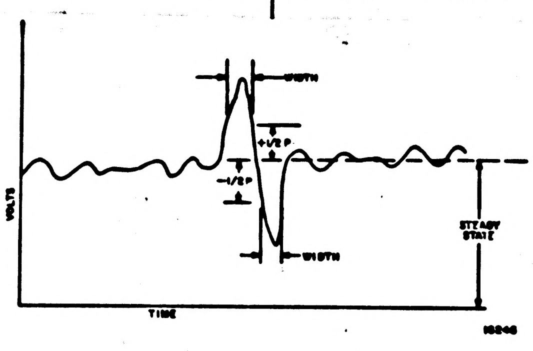

Figure 1. Signal Characteristics Diagram

NOTE: Step 60 applies to
Indicator Control panel
2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies
to all Indicator Control
panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

NOTE: Step 62 applies to
Indicator Control panel
2021290 only.

62. Set OPTICS ZERO switch on Indicator Control panel to OFF.

NOTE: Step 62A applies to
all Indicator Control panels
except 2021290.

62A. Set OPTICS MODE switch on Indicator Control panel to MAN.

63. Press MARK pushbutton. Observe DSKY displays VERB 06 NOUN 56 and data in the following form:

a. Row 1 = ±XXX.XX (Shaft angle in degrees)

b. Row 2 = ±XX.XXX (Trunnion angle in degrees)

c. Row 3 = XXX.XX (Time in seconds)

Record Row 1, Row 2, and Row 3 indications.

64. Approximately 60 seconds after first mark, press MARK pushbutton again and record new Row 1, Row 2, and Row 3 indications.

NOTE: Step 65 applies to
Indicator Control panel
2021290 only.

65. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 65A applies to
all Indicator Control panels
except 2021290.

65A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

66. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

CALCULATIONS

67. Perform the following calculations for hand controller drift rates:

a. Δ Shaft angle = step 64.a - step 63.a

b. Δ Trunnion angle = step 64.b - step 63.b

NOTE: If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

c. Δ Time = step 64.c - step 63.c

d. Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$

e. Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$

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EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12213
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INITIAL TDRR 29862

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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EQUIPMENT TEST
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	0.02		0.1		
42	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
46	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
47	SCT TRUN MDA TACH MON	V rms	0.005		0.013		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
54	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
55	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12213
REV. M

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63.a	Shaft angle	deg	▨	( ) ___.___	▨		
63.b	Trunnion angle	deg	▨	( ) __.___	▨		
63.c	Time	sec	▨	___.__	▨		
64.a	Shaft angle	deg	▨	( ) ___.__	▨		
64.b	Trunnion angle	deg	▨	( ) __.___	▨		
64.c	Time	sec	▨	___.__	▨		
67.a	Δ Shaft angle	deg	▨		▨		
67.b	Δ Trunnion angle	deg	▨		▨		
67.c	Δ Time	sec	▨		▨		
67.d	Shaft drift rate	deg/ sec	-0.0333		+0.0333		
67.e	Trunnion drift rate	deg/ sec	-0.0167		+0.0167		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12213
REV. M

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	CALCULATIONS
67.a	Δ Shaft angle = step 64.a - step 63.a Δ Shaft angle =
67.b	Δ Trunnion angle - step 64.b - step 63.b Δ Trunnion angle =
67.c	Δ Time = step 64.c - step 63.c Δ Time =
67.d	Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$ Shaft drift rate =
67.e	Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$ Trunnion drift rate =

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JOB OPTICS SLEW RATE TEST

JDC 12213 REV. N PAGE 1 OF 8

INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1,6	-	EA	-
D	1-12-67	32621	1,4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2, 3, 4	EA	-
L	10-5-67	34806			EA	-
M	12-7-67	35208	7, 8	4, 5	EA	-
N	1-16-68	35450	5	2, 3	EA	

REFERENCES PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies to Indicator Control panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF

b. OPTICS TEL TRUN to SLAVE TO SXT

c. OPTICS COUPLING to DIRECT

d. OPTICS MODE to MAN

e. OPTICS SPEED to HI

NOTE: Step 3A applies to all Indicator Control panels except 2021290.

3A. Set switches on Indicator Control panel as follows:

a. OPTICS MODE to MAN

b. OPTICS CONTROLLER SPEED to HI

c. OPTICS CONTROLLER COUPLING to DIRECT

d. OPTICS TRACKER to OFF

e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO

VERIFICATION WITH SIDL REQUIRED BEFORE USE

PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to Indicator Control panel 2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to all Indicator Control panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

NOTE: Step 15 applies to Indicator Control panel 2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 15A applies to all Indicator Control panels except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to Indicator Control panel 2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to all Indicator Control panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

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28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to Indicator Control panel 2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to all Indicator Control panels except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Deleted.

NOTE: Step 40 applies to Indicator Control panel 2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies to all Indicator Control panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the voltage indicated on the PAVM while holding Optics Hand Controller to the lower limit until SXT is against Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC. Continue holding Optics Hand Controller to lower limit.

42. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 06. Measure and record the SXT Trun MDA P/A voltage indicated on PAVM. Release Optics Hand Controller.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2
b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

47A. Measure and record the steady state voltage indicated on PAVM while holding Optics Hand Controller to lower limit. Release Optics Hand Controller.

47B. Add the absolute value recorded in step 46 to the absolute value recorded in step 47A and divide by two. Record results as average value of SCT Trun MDA Tach Mon.

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48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

50. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 10 MV/MM.

NOTE: Step 51 applies to Indicator Control panel 2021290 only.

51. Set OPTICS ZERO switch on Indicator Control Panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies to all Indicator Control panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

53. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

54. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

55. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

56. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

57. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5 MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

58. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

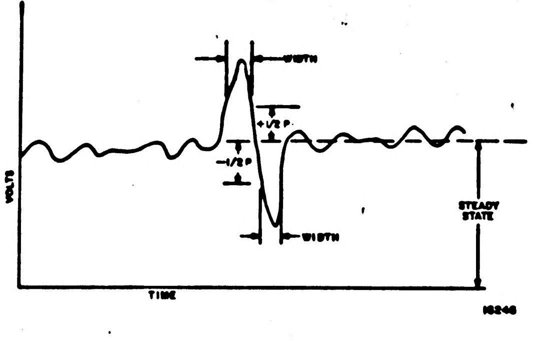

Figure 1. Signal Characteristics Diagram

NOTE: Step 60 applies to Indicator Control panel 2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies to all Indicator Control panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

	Signal	CROSSBAR CONTROL
a.	SCT Trun MDA P/A Mon.	103
b.	SXT Shaft MDA P/A Mon.	203
c.	SXT Trun MDA P/A Mon.	106
d.	SCT Shaft MDA P/A Mon.	210

NOTE: Step 62 applies to Indicator Control panel 2021290 only.

62. Set OPTICS ZERO switch on Indicator Control panel to OFF.

NOTE: Step 62A applies to all Indicator Control panels except 2021290.

62A. Set OPTICS MODE switch on Indicator Control panel to MAN.

63. Press MARK pushbutton. Observe DSKY displays VERB 06 NOUN 56 and data in the following form:

a. Row 1 = ±XXX.XX (Shaft angle in degrees)
b. Row 2 = ±XX.XXX (Trunnion angle in degrees)
c. Row 3 = XXX.XX (Time in seconds)

Record Row 1, Row 2, and Row 3 indications.

64. Approximately 60 seconds after first mark, press MARK pushbutton again and record new Row 1, Row 2, and Row 3 indications.

NOTE: Step 65 applies to Indicator Control panel 2021290 only.

65. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 65A applies to all Indicator Control panels except 2021290.

65A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

66. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

CALCULATIONS

67. Perform the following calculations for hand controller drift rates:

a. Δ Shaft angle = step 64.a - step 63.a
b. Δ Trunnion angle = step 64.b - step 63.b

NOTE: If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

c. Δ Time = step 64.c - step 63.c
d. Shaft drift rate = $\frac{\Delta \text{Shaft angle}}{\Delta \text{Time}}$
e. Trunnion drift rate = $\frac{\Delta \text{Trunnion angle}}{\Delta \text{Time}}$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12213
REV. N
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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FORM [illegible]
Chg. [illegible] 3-[illegible]

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12213
REV. N

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	0.02		0.1		
42	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
46	SCT TRUN MDA TACH MON	V rms	▨		▨		
47	SCT TRUN MDA TACH MON	V rms	▨		▨		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12213
REV. N

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
47A	SCT TRUN MDA TACH MON	V rms	▨		▨		
47B	SCT TRUN MDA TACH MON (AVERAGE VALUE)	V rms	0.005		0.013		
53	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
54	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
55	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12213
REV. N

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
61 (cont)	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
63.a	Shaft angle	deg	▨	( ) ___.__	▨		
63.b	Trunnion angle	deg	▨	( ) ___.__	▨		
63.c	Time	sec	▨	___.__	▨		
64.a	Shaft angle	deg	▨	( ) ___.__	▨		
64.b	Trunnion angle	deg	▨	( ) ___.__	▨		
64.c	Time	sec	▨	___.__	▨		
67.a	Δ Shaft angle	deg	▨		▨		
67.b	Δ Trunnion angle	deg	▨		▨		
67.c	Δ Time	sec	▨		▨		
67.d	Shaft drift rate	deg/sec	-0.0333		+0.0333		
67.e	Trunnion drift rate	deg/sec	-0.0167		+0.0167		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12213
REV. N

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	CALCULATIONS
67.a	Δ Shaft angle = step 64.a - step 63.a Δ Shaft angle =
67.b	Δ Trunnion angle - step 64.b - step 63.b Δ Trunnion angle =
67.c	Δ Time = step 64.c - step 63.c Δ Time =
67.d	Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$ Shaft drift rate =
67.e	Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$ Trunnion drift rate =

DATE 30 JUN 66

JOB OPTICS SLEW RATE TEST

JDC 12213 REV. P PAGE 1 OF 8

INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2, 3, 4	EA	-
L	10-5-67	34806			EA	-
M	12-7-67	35208	7, 8	4, 5	EA	-
N	1-16-68	35450	5	2, 3	EA	-
P	2-29-68	35771	4, 5, 6	-	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies to Indicator Control panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF

b. OPTICS TEL TRUN to SLAVE TO SXT

c. OPTICS COUPLING to DIRECT

d. OPTICS MODE to MAN

e. OPTICS SPEED to HI

NOTE: Step 3A applies to all Indicator Control panels except 2021290.

3A. Set switches on Indicator Control panel as follows:

a. OPTICS MODE to MAN

b. OPTICS CONTROLLER SPEED to HI

c. OPTICS CONTROLLER COUPLING to DIRECT

d. OPTICS TRACKER to OFF

e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to Indicator Control panel 2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to all Indicator Control panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

NOTE: Step 15 applies to Indicator Control panel 2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

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NOTE: Step 15A applies to all Indicator Control panels except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to Indicator Control panel 2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to all Indicator Control panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

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28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to Indicator Control panel 2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to all Indicator Control panels except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Set the DEGREES dial on the PAVM to 50.

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NOTE: Step 40 applies to
Indicator Control panel
2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies
to all Indicator Control
panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the voltage indicated on the PAVM while optics is slewing by holding Optics Hand Controller to the lower limit. Continue holding Optics Hand Controller to the lower limit until SXT is against Trunnion stop as indicated by a nominal (unchanging) value on the Trunnion TPAC and continue holding Optics Hand Controller to lower limit.

42. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 06. Set the DEGREES dial on the PAVM to 0. Measure and record the SXT Trun MDA P/A voltage indicated on PAVM. Release Optics Hand Controller.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2
b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

47A. Measure and record the steady state voltage indicated on PAVM while holding Optics Hand Controller to lower limit. Release Optics Hand Controller.

47B. Add the absolute value recorded in step 46 to the absolute value recorded in step 47A and divide by two. Record results as average value of SCT Trun MDA Tach Mon.

48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

50. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 10 MV/MM.

NOTE: Step 51 applies to
Indicator Control panel
2021290 only.

51. Set OPTICS ZERO switch on Indicator Control Panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies
to all Indicator Control
panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

53. Measure and record voltage indicated on PAVM while optics is slewing by holding Optics Hand Controller to right limit. Continue holding Optics Hand Controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on the Shaft TPAC. Set CHART DRIVE switch to OFF and continue holding the Optics Hand Controller to right limit.

54. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics Hand Controller.

55. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

56. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

57. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5 MV/MM and set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

58. Hold Optics Hand Controller to left limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of approximately +90° on the Shaft TPAC. Release Optics Hand Controller and set the CHART DRIVE switch to OFF.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

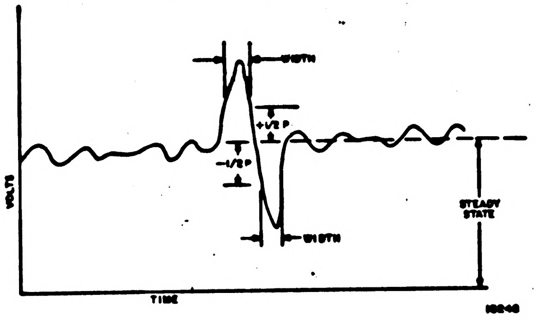

Figure 1. Signal Characteristics Diagram

NOTE: Step 60 applies to
Indicator Control panel
2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies
to all Indicator Control
panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

NOTE: Step 62 applies to
Indicator Control panel
2021290 only.

62. Set OPTICS ZERO switch on Indicator Control panel to OFF.

NOTE: Step 62A applies to
all Indicator Control panels
except 2021290.

62A. Set OPTICS MODE switch on Indicator Control panel to MAN.

63. Press MARK pushbutton. Observe DSKY displays VERB 06 NOUN 56 and data in the following form:

a. Row 1 = ±XXX.XX (Shaft angle in degrees)
b. Row 2 = ±XX.XXX (Trunnion angle in degrees)
c. Row 3 = XXX.XX (Time in seconds)

Record Row 1, Row 2, and Row 3 indications.

64. Approximately 60 seconds after first mark, press MARK pushbutton again and record new Row 1, Row 2, and Row 3 indications.

NOTE: Step 65 applies to
Indicator Control panel
2021290 only.

65. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 65A applies to
all Indicator Control panels
except 2021290.

65A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

66. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

CALCULATIONS

67. Perform the following calculations for hand controller drift rates:

a. Δ Shaft angle = step 64.a - step 63.a
b. Δ Trunnion angle = step 64.b - step 63.b

NOTE: If step 64.c is less
than step 63.c, add 163.84
seconds to step 64.c.

c. Δ Time = step 64.c - step 63.c
d. Shaft drift rate = $\frac{\Delta \text{Shaft angle}}{\Delta \text{Time}}$
e. Trunnion drift rate = $\frac{\Delta \text{Trunnion angle}}{\Delta \text{Time}}$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12213
REV. P
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ____________________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________________ SER. NO. ________ ________ CAL DATE
NAME ____________________ SER. NO. ________ ________ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12213
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	0.02		0.1		
42	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
46	SCT TRUN MDA TACH MON	V rms	▨		▨		
47	SCT TRUN MDA TACH MON	V rms	▨		▨		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
47A	SCT TRUN MDA TACH MON	V rms	▨		▨		
47B	SCT TRUN MDA TACH MON (AVERAGE VALUE)	V rms	0.006		0.013		
53	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
54	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
55	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12213
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
61 (cont)	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
63.a	Shaft angle	deg	▨	( ) _ _ _ . _ _	▨		
63.b	Trunnion angle	deg	▨	( ) _ _ . _ _ _	▨		
63.c	Time	sec	▨	_ _ _ . _ _	▨		
64.a	Shaft angle	deg	▨	( ) _ _ _ . _ _	▨		
64.b	Trunnion angle	deg	▨	( ) _ _ . _ _ _	▨		
64.c	Time	sec	▨	_ _ _ . _ _	▨		
67.a	Δ Shaft angle	deg	▨		▨		
67.b	Δ Trunnion angle	deg	▨		▨		
67.c	Δ Time	sec	▨		▨		
67.d	Shaft drift rate	deg/sec	-0.0333		+0.0333		
67.e	Trunnion drift rate	deg/sec	-0.0167		+0.0167		

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EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12213
REV P

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	CALCULATIONS
67.a	Δ Shaft angle = step 64.a - step 63.a Δ Shaft angle =
67.b	Δ Trunnion angle - step 64.b - step 63.b Δ Trunnion angle =
67.c	Δ Time = step 64.c - step 63.c Δ Time =
67.d	Shaft drift rate = $\frac{\Delta \text{Shaft angle}}{\Delta \text{Time}}$ Shaft drift rate =
67.e	Trunnion drift rate = $\frac{\Delta \text{Trunnion angle}}{\Delta \text{Time}}$ Trunnion drift rate =

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JOB OPTICS SLEW RATE TEST

JDC 12213 REV. R PAGE 1 OF 8

INITIAL TDRR 29882 D.S PGS 5

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2, 3, 4	EA	-
L	10-5-67	34806			EA	-
M	12-7-67	35208	7, 8	4, 5	EA	-
N	1-16-68	35450	5	2, 3	EA	-
P	2-29-68	35771	4, 5, 6	-	EA	-
R	4-29-68	36124	1,2,5,6	2,3	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies to Indicator Control panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF

b. OPTICS TEL TRUN to SLAVE TO SXT

c. OPTICS COUPLING to DIRECT

d. OPTICS MODE to MAN

e. OPTICS SPEED to HI

NOTE: Step 3A applies to all Indicator Control panels except 2021290.

3A. Set switches on Indicator Control panel as follows:

a. OPTICS MODE to MAN

b. OPTICS CONTROLLER SPEED to HI

c. OPTICS CONTROLLER COUPLING to DIRECT

d. OPTICS TRACKER to OFF

e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to Indicator Control panel 2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to all Indicator Control panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 5 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

14A. Using the Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 15 applies to Indicator Control panel 2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 15A applies to all Indicator Control panels except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to Indicator Control panel 2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to all Indicator Control panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to Indicator Control panel 2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to all Indicator Control panels except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Set the DEGREES dial on the PAVM to 50.

NOTE: Step 40 applies to
Indicator Control panel
2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies
to all Indicator Control
panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the steady state voltage indicated on the PAVM while holding Optics Hand Controller to the upper limit.

42. Release Optics Hand Controller. Set the DEGREES dial on the PAVM to 0.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 06 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2

b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

47A. Measure and record the steady state voltage indicated on PAVM while holding Optics Hand Controller to lower limit. Release Optics Hand Controller.

47B. Add the absolute value recorded in step 46 to the absolute value recorded in step 47A and divide by two. Record results as average value of SCT Trun MDA Tach Mon.

48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

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49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

50. Using the Optics Hand Controller with the OPTICS SPEED switch set to HI, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 51 applies
to Indicator Control
panel 2021290 only.

51. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies
to all Indicator Control
panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Connect the PSA TPA #2 output TB3-32 (RED) HI and TB3-28 (BLK) LO to the Buffered Probe input J7 HI and J8 LO.

53. On the AUX INPUT PANEL, connect the Buffered Probe output to the Channel 3 AC input, to monitor the SCT Shaft MDA TACH Mon. signal on CHANNEL 3. Set the CHANNEL 3 switch on the AUX INPUT PANEL to OSS 800 cps.

54. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 3 sensitivity to 5 MV/MM on Oscillograph Amplifier panel.

55. Holding the Optics Hand Controller to the left with the OPTICS SPEED switch set to HI, position the SXT Shaft to (-180° ± 1°) indicated by the Shaft TPAC. Return the OPTICS SPEED SWITCH to LO.

56. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

57. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to right limit. Continue holding Optics Hand Controller to right limit until SXT Shaft reaches +180° as indicated by the Shaft TPAC.

58. Release the Optics Hand Controller and set CHART DRIVE switch to OFF.

59. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indications of CHANNEL 1 and CHANNEL 3 per Figure 1. Record the maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 and CHANNEL 3 per Figure 1.

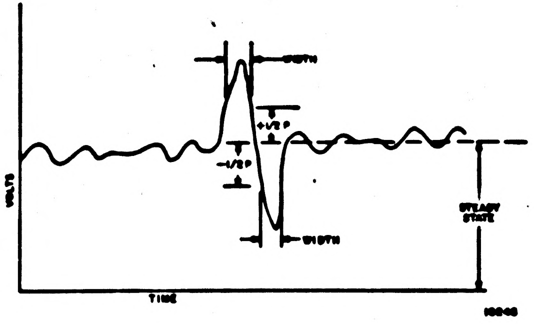

Figure 1. Signal Characteristics Diagram

NOTE: Step 60 applies to
Indicator Control panel
2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies
to all Indicator Control
panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

	Signal	CROSSBAR CONTROL
a.	SCT Trun MDA P/A Mon.	103
b.	SXT Shaft MDA P/A Mon.	203
c.	SXT Trun MDA P/A Mon.	106
d.	SCT Shaft MDA P/A Mon.	210

NOTE: Step 62 applies to
Indicator Control panel
2021290 only.

62. Set OPTICS ZERO switch on Indicator Control panel to OFF.

NOTE: Step 62A applies to
all Indicator Control panels
except 2021290.

62A. Set OPTICS MODE switch on Indicator Control panel to MAN.

63. Press MARK pushbutton. Observe DSKY displays VERB 06 NOUN 56 and data in the following form:

a. Row 1 = ±XXX.XX (Shaft angle in degrees)

b. Row 2 = ±XX.XXX (Trunnion angle in degrees)

c. Row 3 = XXX.XX (Time in seconds)

Record Row 1, Row 2, and Row 3 indications.

64. Approximately 60 seconds after first mark, press MARK pushbutton again and record new Row 1, Row 2, and Row 3 indications.

NOTE: Step 65 applies to
Indicator Control panel
2021290 only.

65. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 65A applies to
all Indicator Control panels
except 2021290.

65A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

66. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

CALCULATIONS

67. Perform the following calculations for hand controller drift rates:

a. Δ Shaft angle = step 64.a - step 63.a

b. Δ Trunnion angle = step 64.b - step 63.b

NOTE: If step 64.c is less
than step 63.c, add 163.84
seconds to step 64.c.

c. Δ Time = step 64.c - step 63.c

d. Shaft drift rate = $\frac{\Delta \text{Shaft angle}}{\Delta \text{Time}}$

e. Trunnion drift rate = $\frac{\Delta \text{Trunnion angle}}{\Delta \text{Time}}$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC NO. 12213
REV. R
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC NO. 12213
REV. R

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	0.02		0.1		
46	SCT TRUN MDA TACH MON	V rms	▨		▨		
47	SCT TRUN MDA TACH MON	V rms	▨		▨		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC NO. 12213
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
47A	SCT TRUN MDA TACH MON	V rms	▨		▨		
47B	SCT TRUN MDA TACH MON (AVERAGE VALUE)	V rms	0.005		0.013		
57	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
59	SXT SHAFT MDA TACH MON (CHANNEL 1)	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON (CHANNEL 3)	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC NO. 12213
REV. R

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
61 (cont)	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
63.a	Shaft angle	deg	▨	( ) ___ . __	▨		
63.b	Trunnion angle	deg	▨	( ) __ . __	▨		
63.c	Time	sec	▨	___ . __	▨		
64.a	Shaft angle	deg	▨	( ) ___ . __	▨		
64.b	Trunnion angle	deg	▨	( ) __ . __	▨		
64.c	Time	sec	▨	___ . __	▨		
67.a	Δ Shaft angle	deg	▨		▨		
67.b	Δ Trunnion angle	deg	▨		▨		
67.c	Δ Time	sec	▨		▨		
67.d	Shaft drift rate	deg/sec	-0.0333		+0.0333		
67.e	Trunnion drift rate	deg/sec	-0.0167		+0.0167		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12213
REV. R

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	CALCULATIONS
67.a	Δ Shaft angle = step 64.a - step 63.a Δ Shaft angle =
67.b	Δ Trunnion angle - step 64.b - step 63.b Δ Trunnion angle =
67.c	Δ Time = step 64.c - step 63.c Δ Time =
67.d	Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$ Shaft drift rate =
67.e	Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$ Trunnion drift rate =

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JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1,6	-	EA	-
D	1-12-67	32621	1,4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4,5,6	2,3,4	EA	-
L	10-5-67	34806			EA	-
M	12-7-67	35208	7,8	4,5	EA	-
N	1-16-68	35450	5	2,3	EA	-
P	2-29-68	35771	4,5,6	-	EA	-
R	4-29-68	36124	1,2,5,6	2,3	EA	-
S	7-11-68	36514	1,8	-	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The G & N Mounting Fixture shall be set at the 90.0° position.

2. Oscilloscope Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies
to Indicator Control
panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF
b. OPTICS TEL TRUN to SLAVE TO SXT
c. OPTICS COUPLING to DIRECT
d. OPTICS MODE to MAN
e. OPTICS SPEED to HI

NOTE: Step 3A applies to
all Indicator Control panels
except 2021290.

3A. Set switches on Indicator Control panel as follows:

a. OPTICS MODE to MAN
b. OPTICS CONTROLLER SPEED to HI
c. OPTICS CONTROLLER COUPLING to DIRECT
d. OPTICS TRACKER to OFF
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO

VERIFICATION WITH SIOL REQUIRED BEFORE USE

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JOB OPTICS SLEW RATE TEST

JDC 12213 REV 8 PAGE 2 OF 8

SUBSYSTEM G AND N SYSTEM

ASSY

PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2
b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to
Indicator Control panel
2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to
all Indicator Control
panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 5 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

14A. Using the Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 15 applies to
Indicator Control panel
2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

ASSY

NOTE: Step 15A applies to
all Indicator Control panels
except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to
Indicator Control panel
2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to
all Indicator Control
panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

ASSY

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to
Indicator Control panel
2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to
all Indicator Control panels
except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Set the DEGREES dial on the PAVM to 50.

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NOTE: Step 40 applies to Indicator Control panel 2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies to all Indicator Control panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the steady state voltage indicated on the PAVM while holding Optics Hand Controller to the upper limit.

42. Release Optics Hand Controller. Set the DEGREES dial on the PAVM to 0.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 06 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2

b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

47A. Measure and record the steady state voltage indicated on PAVM while holding Optics Hand Controller to lower limit. Release Optics Hand Controller.

47B. Add the absolute value recorded in step 46 to the absolute value recorded in step 47A and divide by two. Record results as average value of SCT Trun MDA Tach Mon.

48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

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49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

50. Using the Optics Hand Controller with the OPTICS SPEED switch set to HI, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 51 applies to Indicator Control panel 2021290 only.

51. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies to all Indicator Control panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Connect the PSA TPA #2 output TB3-32 (RED) HI and TB3-28 (BLK) LO to the Buffered Probe input J7 HI and J8 LO.

53. On the AUX INPUT PANEL, connect the Buffered Probe output to the Channel 3 AC input, to monitor the SCT Shaft MDA TACH Mon. signal on CHANNEL 3. Set the CHANNEL 3 switch on the AUX INPUT PANEL to OSS 800 cps.

54. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 3 sensitivity to 5 MV/MM on Oscillograph Amplifier panel.

55. Holding the Optics Hand Controller to the left with the OPTICS SPEED switch set to HI, position the SXT Shaft to (-180° ± 1°) indicated by the Shaft TPAC. Return the OPTICS SPEED SWITCH to LO.

56. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

57. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to right limit. Continue holding Optics Hand Controller to right limit until SXT Shaft reaches +180° as indicated by the Shaft TPAC.

58. Release the Optics Hand Controller and set CHART DRIVE switch to OFF.

59. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indications of CHANNEL 1 and CHANNEL 3 per Figure 1. Record the maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 and CHANNEL 3 per Figure 1.

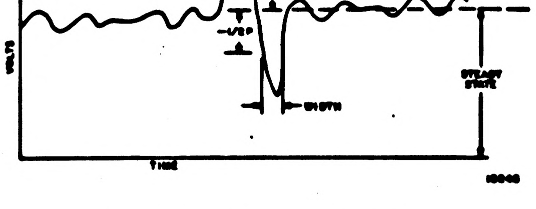

Figure 1. Signal Characteristics Diagram

NOTE: Step 60 applies to Indicator Control panel 2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies to all Indicator Control panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

NOTE: Step 62 applies to Indicator Control panel 2021290 only.

62. Set OPTICS ZERO switch on Indicator Control panel to OFF.

NOTE: Step 62A applies to all Indicator Control panels except 2021290.

62A. Set OPTICS MODE switch on Indicator Control panel to MAN.

63. Press MARK pushbutton. Observe DSKY displays VERB 06 NOUN 56 and data in the following form:

a. Row 1 = ±XXX.XX (Shaft angle in degrees)

b. Row 2 = ±XX.XXX (Trunnion angle in degrees)

c. Row 3 = XXX.XX (Time in seconds)

Record Row 1, Row 2, and Row 3 indications.

64. Approximately 60 seconds after first mark, press MARK pushbutton again and record new Row 1, Row 2, and Row 3 indications.

NOTE: Step 65 applies to Indicator Control panel 2021290 only.

65. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 65A applies to all Indicator Control panels except 2021290.

65A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

66. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

66A. Return the G & N Mounting Fixture to the 0° position.

CALCULATIONS

67. Perform the following calculations for hand controller drift rates:

a. Δ Shaft angle = step 64.a - step 63.a

b. Δ Trunnion angle = step 64.b - step 63.b

NOTE: If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

c. Δ Time = step 64.c - step 63.c

d. Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$

e. Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12213
REV. S
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ____________________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________________ SER. NO. ________ ________ CAL DATE

NAME ____________________ SER. NO. ________ ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12213
REV. S

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	0.02		0.1		
46	SCT TRUN MDA TACH MON	V rms	▨		▨		
47	SCT TRUN MDA TACH MON	V rms	▨		▨		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12213
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
47A	SCT TRUN MDA TACH MON	V rms	▨		▨		
47B	SCT TRUN MDA TACH MON (AVERAGE VALUE)	V rms	0.005		0.013		
57	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
58	SXT SHAFT MDA TACH MON (CHANNEL 1)	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON (CHANNEL 3)	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12213
REV. S

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
61 (cont)	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
63.a	Shaft angle	deg	▨	( ) _ _ _ . _ _	▨		
63.b	Trunnion angle	deg	▨	( ) _ _ . _ _ _	▨		
63.c	Time	sec	▨	_ _ _ . _ _	▨		
64.a	Shaft angle	deg	▨	( ) _ _ _ . _ _	▨		
64.b	Trunnion angle	deg	▨	( ) _ _ . _ _ _	▨		
64.c	Time	sec	▨	_ _ _ . _ _	▨		
67.a	Δ Shaft angle	deg	▨		▨		
67.b	Δ Trunnion angle	deg	▨		▨		
67.c	Δ Time	sec	▨		▨		
67.d	Shaft drift rate	deg/sec	-0.0333		+0.0333		
67.e	Trunnion drift rate	deg/sec	-0.0167		+0.0167		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12213
REV. S

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	CALCULATIONS
67.a	Δ Shaft angle = step 64.a - step 63.a Δ Shaft angle =
67.b	Δ Trunnion angle - step 64.b - step 63.b Δ Trunnion angle =
67.c	Δ Time = step 64.e - step 63.c Δ Time =
67.d	Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$ Shaft drift rate =
67.e	Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$ Trunnion drift rate =

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JOB OPTICS SLEW RATE TEST

JDC 12213 REV. T PAGE 1 OF 8

INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev Ltr	Date	TDRR NO	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2, 3, 4	EA	-
L	10-5-67	34806			EA	-
M	12-7-67	35208	7, 8	4, 5	EA	-
N	1-16-68	35450	5	2, 3	EA	-
P	2-29-68	35771	4, 5, 6	-	EA	-
R	4-29-68	36124	1, 2, 5, 6	2, 3	EA	-
S	7-11-68	36514	1, 8	-	EA	-
T	9-12-68	36819	1, 8	-	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The G & N Mounting Fixture shall be set at the 90.0° position. Care must be taken to prevent gimbal lock (see JDC 12215).

2. Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies to Indicator Control panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

- a. OPTICS ZERO to OFF
- b. OPTICS TEL TRUN to SLAVE TO SXT
- c. OPTICS COUPLING to DIRECT
- d. OPTICS MODE to MAN
- e. OPTICS SPEED to HI

NOTE: Step 3A applies to all Indicator Control panels except 2021290.

3A. Set switches on Indicator Control panel

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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as follows:

- a. OPTICS MODE to MAN
- b. OPTICS CONTROLLER SPEED to HI
- c. OPTICS CONTROLLER COUPLING to DIRECT
- d. OPTICS TRACKER to OFF
- e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

- a. SXT Trunnion MDA Tach Mon. on CHANNEL 2
- b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to Indicator Control panel 2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to all Indicator Control panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 5 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and

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CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

14A. Using the Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 15 applies to Indicator Control panel 2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 15A applies to all Indicator Control panels except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to Indicator Control panel 2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to all Indicator Control panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics

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Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to Indicator Control panel 2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to all Indicator Control panels except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on

CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Set the DEGREES dial on the PAVM to 50.

NOTE: Step 40 applies to Indicator Control panel 2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies to all Indicator Control panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the steady state voltage indicated on the PAVM while holding Optics Hand Controller to the upper limit.

42. Release Optics Hand Controller. Set the DEGREES dial on the PAVM to 0.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2

b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

47A. Measure and record the steady state voltage indicated on PAVM while holding Optics Hand Controller to lower limit. Release Optics Hand Controller.

47B. Add the absolute value recorded in step 46 to the absolute value recorded in step 47A and divide by two. Record results as average value of SCT Trun MDA Tach Mon.

48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Shaft Fine Error.

50. Using the Optics Hand Controller with the OPTICS SPEED switch set to HI, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 51 applies to Indicator Control panel 2021290 only.

51. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies to all Indicator Control panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Connect the PSA TPA #2 output TB3-32 (RED) HI and TB3-28 (BLK) LO to the Buffered Probe input J7 HI and J8 LO.

53. On the AUX INPUT PANEL, connect the Buffered Probe output to the Channel 3 AC input, to monitor the SCT Shaft MDA TACH Mon. signal on CHANNEL 3. Set the CHANNEL 3 switch on the AUX INPUT PANEL to OSS 800 cps.

54. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 3 sensitivity to 5 MV/MM on Oscillograph Amplifier panel.

55. Holding the Optics Hand Controller to the left with the OPTICS SPEED switch set to HI, position the SXT Shaft to (-180° ± 1°) indicated by the Shaft TPAC. Return the OPTICS SPEED SWITCH to LO.

56. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

57. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to right limit. Continue holding Optics Hand Controller to right limit until SXT Shaft reaches +180° as indicated by the Shaft TPAC.

58. Release the Optics Hand Controller and set CHART DRIVE switch to OFF.

59. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indications of CHANNEL 1 and CHANNEL 3 per Figure 1. Record the maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 and CHANNEL 3 per Figure 1.

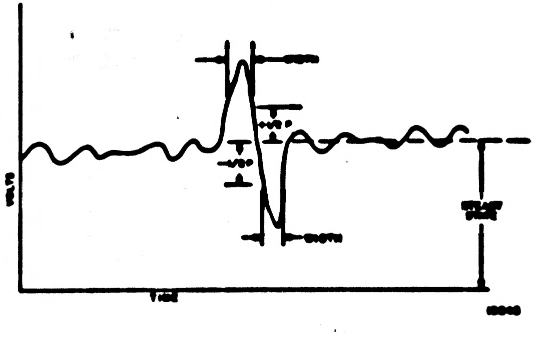

Figure 1. Signal Characteristics Diagram

NOTE: Step 60 applies to Indicator Control panel 2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies to all Indicator Control panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

	Signal	CROSSBAR CONTROL
a.	SCT Trun MDA P/A Mon.	103
b.	SXT Shaft MDA P/A Mon.	203
c.	SXT Trun MDA P/A Mon.	106
d.	SCT Shaft MDA P/A Mon.	210

NOTE: Step 62 applies to Indicator Control panel 2021290 only.

62. Set OPTICS ZERO switch on Indicator Control panel to OFF.

NOTE: Step 62A applies to all Indicator Control panels except 2021290.

62A. Set OPTICS MODE switch on Indicator Control panel to MAN.

63. Press MARK pushbutton. Observe DSKY displays VERB 06 NOUN 56 and data in the following form:

a. Row 1 = ±XXX.XX (Shaft angle in degrees)

b. Row 2 = ±XX.XXX (Trunnion angle in degrees)

c. Row 3 = XXX.XX (Time in seconds)

Record Row 1, Row 2, and Row 3 indications.

64. Approximately 60 seconds after first mark, press MARK pushbutton again and record new Row 1, Row 2, and Row 3 indications.

NOTE: Step 65 applies to Indicator Control panel 2021290 only.

65. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 65A applies to all Indicator Control panels except 2021290.

65A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

66. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

66A. Return the G & N Mounting Fixture to the 32.5° position.

CALCULATIONS

67. Perform the following calculations for hand controller drift rates:

a. Δ Shaft angle = step 64.a - step 63.a

b. Δ Trunnion angle = step 64.b - step 63.b

NOTE: If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

c. Δ Time = step 64.c - step 63.c

d. Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$

e. Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12213
REV. T
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION ______
TIME ______ START ______ END ______ TOTAL ELAPSED ______

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION ______ APPROVED BY ______ NAME/AFFILIATION ______

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

DATE 30 JUN 66

FORM 00 46
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12213
REV. T

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	0.02		0.1		
46	SCT TRUN MDA TACH MON	V rms	▨		▨		
47	SCT TRUN MDA TACH MON	V rms	▨		▨		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12213
REV. T

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
47A	SCT TRUN MDA TACH MON	V rms	▨		▨		
47B	SCT TRUN MDA TACH MON (AVERAGE VALUE)	V rms	0.005		0.013		
57	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
59	SXT SHAFT MDA TACH MON (CHANNEL 1)	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON (CHANNEL 3)	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12213
REV. T

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
61 (cont)	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
63.a	Shaft angle	deg	▨	( ) _ _ _ . _ _	▨		
63.b	Trunnion angle	deg	▨	( ) _ _ . _ _ _	▨		
63.c	Time	sec	▨	_ _ _ . _ _	▨		
64.a	Shaft angle	deg	▨	( ) _ _ _ . _ _	▨		
64.b	Trunnion angle	deg	▨	( ) _ _ . _ _ _	▨		
64.c	Time	sec	▨	_ _ _ . _ _	▨		
67.a	Δ Shaft angle	deg	▨		▨		
67.b	Δ Trunnion angle	deg	▨		▨		
67.c	Δ Time	sec	▨		▨		
67.d	Shaft drift rate	deg/sec	-0.0333		+0.0333		
67.e	Trunnion drift rate	deg/sec	-0.0167		+0.0167		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12213
REV. T

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	CALCULATIONS
67.a	Δ Shaft angle = step 64.a - step 63.a Δ Shaft angle =
67.b	Δ Trunnion angle - step 64.b - step 63.b Δ Trunnion angle =
67.c	Δ Time = step 64.c - step 63.c Δ Time =
67.d	Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$ Shaft drift rate =
67.e	Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$ Trunnion drift rate =

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JOB OPTICS SLEW RATE TEST

JDC 12213 **REV.** U **PAGE** 1 **OF** 8
INITIAL TDRR 29882 **D.S. PGS** 5

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2, 3, 4	EA	-
L	10-5-67	34806			EA	-
M	12-7-67	35208	7, 8	4, 5	EA	-
N	1-16-68	35450	5	2, 3	EA	-
P	2-29-68	35771	4, 5, 6	-	EA	-
R	4-29-68	36124	1, 2, 5, 6	2, 3	EA	-
S	7-11-68	36514	1, 8	-	EA	-
T	9-12-68	36819	1, 8	-	EA	-
U	10-21-68	36930	6	5	EA	-

REFERENCES
PS-2015000

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The G & N Mounting Fixture shall be set at the 90.0° position. Care must be taken to prevent gimbal lock (see JDC 12215).

2. Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies to Indicator Control panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF
b. OPTICS TEL TRUN to SLAVE TO SXT
c. OPTICS COUPLING to DIRECT
d. OPTICS MODE to MAN
e. OPTICS SPEED to HI

NOTE: Step 3A applies to all Indicator Control panels except 2021290.

3A. Set switches on Indicator Control panel

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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as follows:

a. OPTICS MODE to MAN
b. OPTICS CONTROLLER SPEED to HI
c. OPTICS CONTROLLER COUPLING to DIRECT
d. OPTICS TRACKER to OFF
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2
b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to Indicator Control panel 2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to all Indicator Control panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 5 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and

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CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

14A. Using the Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 15 applies to Indicator Control panel 2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 15A applies to all Indicator Control panels except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to Indicator Control panel 2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to all Indicator Control panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics

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Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to Indicator Control panel 2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to all Indicator Control panels except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on

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CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Set the DEGREES dial on the PAVM to 50.

NOTE: Step 40 applies to Indicator Control panel 2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies to all Indicator Control panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the steady state voltage indicated on the PAVM while holding Optics Hand Controller to the upper limit.

42. Release Optics Hand Controller. Set the DEGREES dial on the PAVM to 0.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2

b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

47A. Measure and record the steady state voltage indicated on PAVM while holding Optics Hand Controller to lower limit. Release Optics Hand Controller.

47B. Add the absolute value recorded in step 46 to the absolute value recorded in step 47A and divide by two. Record results as average value of SCT Trun MDA Tach Mon.

48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

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49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

50. Using the Optics Hand Controller with the OPTICS SPEED switch set to HI, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 51 applies to Indicator Control panel 2021290 only.

51. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies to all Indicator Control panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Connect the PSA TPA #2 output TB3-32 (RED) HI and TB3-28 (BLK) LO to the Buffered Probe input J7 HI and J8 LO.

53. On the AUX INPUT PANEL, connect the Buffered Probe output to the Channel 3 AC input, to monitor the SCT Shaft MDA TACH Mon. signal on CHANNEL 3. Set the CHANNEL 3 switch on the AUX INPUT PANEL to OSS 800 cps. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 15.

54. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 3 sensitivity to 5 MV/MM on Oscillograph Amplifier panel.

55. Holding the Optics Hand Controller to the left with the OPTICS SPEED switch set to HI, position the SXT Shaft to (-180° ± 1°) indicated by the Shaft TPAC. Return the OPTICS SPEED SWITCH to LO.

56. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

57. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to right limit. Continue holding Optics Hand Controller to right limit until SXT Shaft reaches +180° as indicated by the Shaft TPAC.

58. Release the Optics Hand Controller and set CHART DRIVE switch to OFF.

59. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indications of CHANNEL 1 and CHANNEL 3 per Figure 1. Record the maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 and CHANNEL 3 per Figure 1.

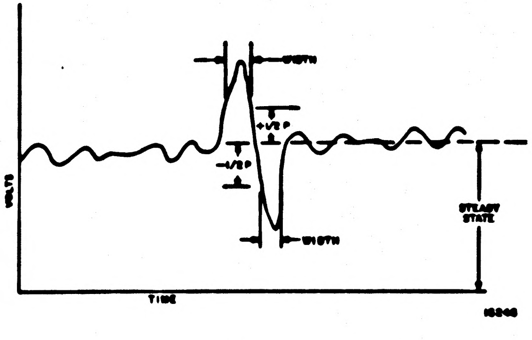

Figure 1. Signal Characteristics Diagram

NOTE: Step 60 applies to Indicator Control panel 2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies to all Indicator Control panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

NOTE: Step 62 applies to Indicator Control panel 2021290 only.

62. Set OPTICS ZERO switch on Indicator Control panel to OFF.

NOTE: Step 62A applies to all Indicator Control panels except 2021290.

62A. Set OPTICS MODE switch on Indicator Control panel to MAN.

63. Press MARK pushbutton. Observe DSKY displays VERB 06 NOUN 56 and data in the following form:

a. Row 1 = ±XXX.XX (Shaft angle in degrees)

b. Row 2 = ±XX.XXX (Trunnion angle in degrees)

c. Row 3 = XXX.XX (Time in seconds)

Record Row 1, Row 2, and Row 3 indications.

64. Approximately 60 seconds after first mark, press MARK pushbutton again and record new Row 1, Row 2, and Row 3 indications.

NOTE: Step 65 applies to Indicator Control panel 2021290 only.

65. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 65A applies to all Indicator Control panels except 2021290.

65A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

66. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

66A. Return the G & N Mounting Fixture to the 32.5° position.

CALCULATIONS

67. Perform the following calculations for hand controller drift rates:

a. Δ Shaft angle = step 64.a - step 63.a

b. Δ Trunnion angle = step 64.b - step 63.b

NOTE: If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

c. Δ Time = step 64.c - step 63.c

d. Shaft drift rate = $\frac{\Delta \text{Shaft angle}}{\Delta \text{Time}}$

e. Trunnion drift rate = $\frac{\Delta \text{Trunnion angle}}{\Delta \text{Time}}$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC NO.	12213
REV.	U
INITIAL TDRR	29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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FORM 0016
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC NO.	12213
REV.	U

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	0.02		0.1		
46	SCT TRUN MDA TACH MON	V rms	▨		▨		
47	SCT TRUN MDA TACH MON	V rms	▨		▨		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC NO.	12213
REV.	U

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
47A	SCT TRUN MDA TACH MON	V rms	▨		▨		
47B	SCT TRUN MDA TACH MON (AVERAGE VALUE)	V rms	0.005		0.013		
57	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
59	SXT SHAFT MDA TACH MON (CHANNEL 1)	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON (CHANNEL 3)	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC NO.	12213
REV.	U

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
61 (cont)	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
63.a	Shaft angle	deg	▨	( )___.__	▨		
63.b	Trunnion angle	deg	▨	( )__.___	▨		
63.c	Time	sec	▨	___.__	▨		
64.a	Shaft angle	deg	▨	( )___.__	▨		
64.b	Trunnion angle	deg	▨	( )__.___	▨		
64.c	Time	sec	▨	___.__	▨		
67.a	Δ Shaft angle	deg	▨		▨		
67.b	Δ Trunnion angle	deg	▨		▨		
67.c	Δ Time	sec	▨		▨		
67.d	Shaft drift rate	deg/sec	-0.0333		+0.0333		
67.e	Trunnion drift rate	deg/sec	-0.0167		+0.0167		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12213
REV. U

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	CALCULATIONS
67.a	Δ Shaft angle = step 64.a - step 63.a Δ Shaft angle =
67.b	Δ Trunnion angle - step 64.b - step 63.b Δ Trunnion angle =
67.c*	Δ Time = step 64.c - step 63.c Δ Time =
67.d	Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$ Shaft drift rate =
67.e	Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$ Trunnion drift rate =

* If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

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JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2, 3, 4	EA BD	-
L	10-5-67	34806			EA BD	-
M	12-7-67	35208	7, 8	4, 5	EA	-
N	1-16-68	35450	5	2, 3	EA BD	-
P	2-29-68	35771	4, 5, 6	-	EA BD	-
R	4-29-68	36124	1, 2, 5, 6	2, 3	EA BD	-
S	7-11-68	36514	1, 8	-	EA	-
T	9-12-68	36819	1, 8	-	EA BD	-
U	10-21-68	36930	6	5	EA	-
V	3-11-69	37404	5	2	EA JF	-

REFERENCES
PS-2015000

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. The G & N Mounting Fixture shall be set at the 90.0° position. Care must be taken to prevent gimbal lock (see JDC 12215).

2. Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies to Indicator Control panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF

b. OPTICS TEL TRUN to SLAVE TO SXT

c. OPTICS COUPLING to DIRECT

d. OPTICS MODE to MAN

e. OPTICS SPEED to HI

NOTE: Step 3A applies to all Indicator Control panels except 2021290.

3A. Set switches on Indicator Control panel

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

ASSY

as follows:

a. OPTICS MODE to MAN

b. OPTICS CONTROLLER SPEED to HI

c. OPTICS CONTROLLER COUPLING to DIRECT

d. OPTICS TRACKER to OFF

e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to Indicator Control panel 2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to all Indicator Control panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 5 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and

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JOB OPTICS SLEW RATE TEST

JDC 12213 REV V PAGE 3 OF 8

SUBSYSTEM G AND N SYSTEM

ASSY

CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

14A. Using the Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 15 applies to Indicator Control panel 2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 15A applies to all Indicator Control panels except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to Indicator Control panel 2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to all Indicator Control panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

ASSY

Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to Indicator Control panel 2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to all Indicator Control panels except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on

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CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Set the DEGREES dial on the PAVM to 50.

NOTE: Step 40 applies to Indicator Control panel 2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies to all Indicator Control panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the steady state voltage and sign indicated on the PAVM while holding Optics Hand Controller to the upper limit.

41A. Measure and record the steady state voltage and sign indicated on the PAVM while holding Optics Hand Controller to the lower limit.

41B. Release Optics Hand Controller. Add the absolute value recorded in step 41 to the absolute value recorded in step 41A. Record the result.

42. Set the DEGREES dial on the PAVM to 0.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2

b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

47A. Measure and record the steady state voltage indicated on PAVM while holding Optics Hand Controller to lower limit. Release Optics Hand Controller.

47B. Add the absolute value recorded in step 46 to the absolute value recorded in step 47A and divide by two. Record results as average value of SCT Trun MDA Tach Mon.

48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

50. Using the Optics Hand Controller with the OPTICS SPEED switch set to HI, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 51 applies to Indicator Control panel 2021290 only.

51. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies to all Indicator Control panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Connect the PSA TPA #2 output TB3-32 (RED) HI and TB3-28 (BLK) LO to the Buffered Probe input J7 HI and J8 LO.

53. On the AUX INPUT PANEL, connect the Buffered Probe output to the Channel 3 AC input, to monitor the SCT Shaft MDA TACH Mon. signal on CHANNEL 3. Set the CHANNEL 3 switch on the AUX INPUT PANEL to OSS 800 cps. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 15.

54. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 3 sensitivity to 5 MV/MM on Oscillograph Amplifier panel.

55. Holding the Optics Hand Controller to the left with the OPTICS SPEED switch set to HI, position the SXT Shaft to $(-180^\circ \pm 1^\circ)$ indicated by the Shaft TPAC. Return the OPTICS SPEED SWITCH to LO.

56. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

57. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to right limit. Continue holding Optics Hand Controller to right limit until SXT Shaft reaches +180° as indicated by the Shaft TPAC.

58. Release the Optics Hand Controller and set CHART DRIVE switch to OFF.

59. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indications of CHANNEL 1 and CHANNEL 3 per Figure 1. Record the maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 and CHANNEL 3 per Figure 1.

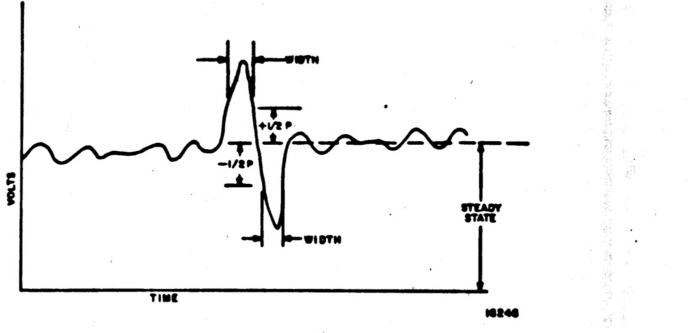

Figure 1. Signal Characteristics Diagram

NOTE: Step 60 applies to Indicator Control panel 2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies to all Indicator Control panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

NOTE: Step 62 applies to Indicator Control panel 2021290 only.

62. Set OPTICS ZERO switch on Indicator Control panel to OFF.

NOTE: Step 62A applies to all Indicator Control panels except 2021290.

62A. Set OPTICS MODE switch on Indicator Control panel to MAN.

63. Press MARK pushbutton. Observe DSKY displays VERB 06 NOUN 56 and data in the following form:

a. Row 1 = ±XXX.XX (Shaft angle in degrees)

b. Row 2 = ±XX.XXX (Trunnion angle in degrees)

c. Row 3 = XXX.XX (Time in seconds)

Record Row 1, Row 2, and Row 3 indications.

64. Approximately 60 seconds after first mark, press MARK pushbutton again and record new Row 1, Row 2, and Row 3 indications.

NOTE: Step 65 applies to Indicator Control panel 2021290 only.

65. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 65A applies to all Indicator Control panels except 2021290.

65A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

66. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

66A. Return the G & N Mounting Fixture to the 32.5° position.

CALCULATIONS

67. Perform the following calculations for hand controller drift rates:

a. Δ Shaft angle = step 64.a - step 63.a

b. Δ Trunnion angle = step 64.b - step 63.b

NOTE: If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

c. Δ Time = step 64.c - step 63.c

d. Shaft drift rate $= \dfrac{\Delta \text{Shaft angle}}{\Delta \text{Time}}$

e. Trunnion drift rate $= \dfrac{\Delta \text{Trunnion angle}}{\Delta \text{Time}}$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12213
REV. V
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSE)

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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JDC
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	▨		▨	▨	▨
41A	TRN CDU FINE ERROR	V rms	▨		▨	▨	▨
41B	TRN CDU FINE ERROR (41 + 41A)	V rms	0.02		0.15		
46	SCT TRUN MDA TACH MON	V rms	▨		▨		
47	SCT TRUN MDA TACH MON	V rms	▨		▨		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		

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EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 1221
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
47 (cont)	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
47A	SCT TRUN MDA TACH MON	V rms	▨		▨		
47B	SCT TRUN MDA TACH MON (AVERAGE VALUE)	V rms	0.005		0.013		
57	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
59	SXT SHAFT MDA TACH MON (CHANNEL 1)	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON (CHANNEL 3)	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12213
REV. V

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
61 (cont)	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
63.a	Shaft angle	deg	▨	( ) ___.__	▨		
63.b	Trunnion angle	deg	▨	( ) __.___	▨		
63.c	Time	sec	▨	___.__	▨		
64.a	Shaft angle	deg	▨	( ) ___.__	▨		
64.b	Trunnion angle	deg	▨	( ) __.___	▨		
64.c	Time	sec	▨	___.__	▨		
67.a	Δ Shaft angle	deg	▨		▨		
67.b	Δ Trunnion angle	deg	▨		▨		
67.c	Δ Time	sec	▨		▨		
67.d	Shaft drift rate	deg/sec	-0.0333		+0.0333		
67.e	Trunnion drift rate	deg/sec	-0.0167		+0.0167		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12213
REV. 1

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	CALCULATIONS
67.a	Δ Shaft angle = step 64.a - step 63.a Δ Shaft angle =
67.b	Δ Trunnion angle - step 64.b - step 63.b Δ Trunnion angle =
67.c*	Δ Time = step 64.c - step 63.c Δ Time =
67.d	Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$ Shaft drift rate =
67.e	Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$ Trunnion drift rate =

* If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

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JOB OPTICS SLEW RATE TEST

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INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2, 3, 4	EA BD	-
L	10-5-67	34806			EA BD	-
M	12-7-67	35208	7, 8	4, 5	EA	-
N	1-16-68	35450	5	2, 3	EA BD	-
P	2-29-68	35771	4, 5, 6	-	EA BD	-
R	4-29-68	36124	1,2,5,6	2,3	EA BD	-
S	7-11-68	36514	1, 8	-	EA	-
T	9-12-68	36819	1, 8	-	EA BD	-
U	10-21-68	36930	6	5	EA	-
V	3-11-69	37404	5	2	EA JF	-
W	5-26-70	38124	1, 8, 9, 10	4, 5	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike crade locking handles.

2. The G&N Mounting Fixture shall be set at the 90.0° position. Care must be taken to prevent gimbal lock (see JDC 12215).

3. Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies to Indicator Control panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF
b. OPTICS TEL TRUN to SLAVE TO SXT
c. OPTICS COUPLING to DIRECT
d. OPTICS MODE to MAN
e. OPTICS SPEED to HI

NOTE: Step 3A applies to all Indicator Control panels except 2021290.

3A. Set switches on Indicator Control panel

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

ASSY

as follows:

a. OPTICS MODE to MAN
b. OPTICS CONTROLLER SPEED to HI
c. OPTICS CONTROLLER COUPLING to DIRECT
d. OPTICS TRACKER to OFF
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2
b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to Indicator Control panel 2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to all Indicator Control panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 5 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

ASSY

CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

14A. Using the Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 15 applies to Indicator Control panel 2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 15A applies to all Indicator Control panels except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to Indicator Control panel 2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to all Indicator Control panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

ASSY

Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to Indicator Control panel 2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to all Indicator Control panels except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on

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CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Set the DEGREES dial on the PAVM to 50.

NOTE: Step 40 applies to Indicator Control panel 2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies to all Indicator Control panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the steady state voltage and sign indicated on the PAVM while holding Optics Hand Controller to the upper limit.

41A. Measure and record the steady state voltage and sign indicated on the PAVM while holding Optics Hand Controller to the lower limit.

41B. Release Optics Hand Controller. Add the absolute value recorded in step 41 to the absolute value recorded in step 41A. Record the result.

42. Set the DEGREES dial on the PAVM to 0.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2

b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

47A. Measure and record the steady state voltage indicated on PAVM while holding Optics Hand Controller to lower limit. Release Optics Hand Controller.

47B. Add the absolute value recorded in step 46 to the absolute value recorded in step 47A and divide by two. Record results as average value of SCT Trun MDA Tach Mon.

48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

50. Using the Optics Hand Controller with the OPTICS SPEED switch set to HI, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 51 applies to Indicator Control panel 2021290 only.

51. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies to all Indicator Control panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Connect the PSA TPA #2 output TB3-32 (RED) HI and TB3-28 (BLK) LO to the Buffered Probe input J7 HI and J8 LO.

53. On the AUX INPUT PANEL, connect the Buffered Probe output to the Channel 3 AC input, to monitor the SCT Shaft MDA TACH Mon. signal on CHANNEL 3. Set the CHANNEL 3 switch on the AUX INPUT PANEL to OSS 800 cps. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 15.

54. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 3 sensitivity to 5 MV/MM on Oscillograph Amplifier panel.

55. Holding the Optics Hand Controller to the left with the OPTICS SPEED switch set to HI, position the SXT Shaft to (-180° ± 1°) indicated by the Shaft TPAC. Return the OPTICS SPEED SWITCH to LO.

56. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

57. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to right limit. Continue holding Optics Hand Controller to right limit until SXT Shaft reaches +180° as indicated by the Shaft TPAC.

58. Release the Optics Hand Controller and set CHART DRIVE switch to OFF.

59. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indications of CHANNEL 1 and CHANNEL 3 per Figure 1. Record the maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 and CHANNEL 3 per Figure 1.

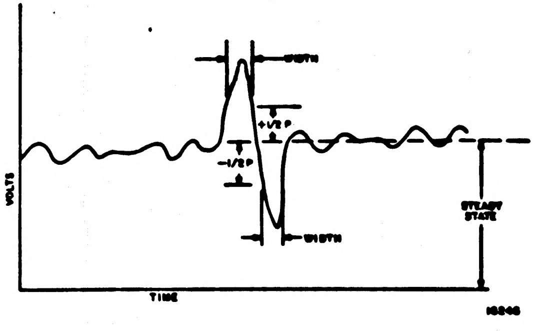

Figure 1. Signal Characteristics Diagram

NOTE: Step 60 applies to Indicator Control panel 2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies to all Indicator Control panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

Signal	CROSSBAR CONTROL
a. SCT Trun MDA P/A Mon.	103
b. SXT Shaft MDA P/A Mon.	203
c. SXT Trun MDA P/A Mon.	106
d. SCT Shaft MDA P/A Mon.	210

NOTE: Step 62 applies to Indicator Control panel 2021290 only.

62. Set OPTICS ZERO switch on Indicator Control panel to OFF.

NOTE: Step 62A applies to all Indicator Control panels except 2021290.

62A. Set OPTICS MODE switch on Indicator Control panel to MAN.

63. Press MARK pushbutton. Observe DSKY displays VERB 06 NOUN 56 and data in the following form:

a. Row 1 = ±XXX.XX (Shaft angle in degrees)

b. Row 2 = ±XX.XXX (Trunnion angle in degrees)

c. Row 3 = XXX.XX (Time in seconds)

Record Row 1, Row 2, and Row 3 indications.

64. Approximately 60 seconds after first mark, press MARK pushbutton again and record new Row 1, Row 2, and Row 3 indications.

NOTE: Step 65 applies to Indicator Control panel 2021290 only.

65. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 65A applies to all Indicator Control panels except 2021290.

65A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

CALCULATIONS

66. Perform the following calculations for hand controller drift rates:

a. Δ Shaft angle = step 64.a - step 63.a

b. Δ Trunnion angle = step 64.b - step 63.b

NOTE: If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

c. Δ Time = step 64.c - step 63.c

d. Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$

e. Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$

NOTE: Steps 67 through 83 apply only if the Indicator Control panel has ECP 792 installed.

COMPUTER AIDED OPTICS TRACKING

67. Set OPTICS ZERO switch on Indicator Control panel to OFF.

68. Set OPTICS MODE switch on Indicator Control panel to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +00000 ENTR
c. +00000 ENTR

69. Set OPTICS MODE switch on Indicator Control panel to MAN.

NOTE: Step 70 must be completed within one minute after completing step 69.

70. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00002 ENTR
d. VERB 16 NOUN 55 ENTR

71. When DSKY display settles out, record the contents of Row 1 and Row 2.

72. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. 00053 ENTR
c. 00360 ENTR
d. 00360 ENTR
e. VERB 21 NOUN 10 ENTR
f. 00012 ENTR
g. 00002 ENTR ENTR
h. 00014 ENTR
i. 06000 ENTR
j. Press KEY RELEASE

73. When DSKY display settles out, record the contents of Row 1 and Row 2.

74. Perform the following calculations:

a. Shaft = Row 1, step 73 minus Row 1, step 71.
b. Trunnion = Row 2, step 73 minus Row 2, step 71.

75. Set OPTICS SPEED switch on Indicator Control panel to MED.

76. Set OPTICS COUPLING switch on Indicator Control panel to DIRECT.

77. Hold the Optics Hand Controller to the right limit and record the contents of Row 1 on the DSKY. Release the Optics Hand Controller.

78. Hold the Optics Hand Controller to the left limit and record the contents of Row 1 on the DSKY. Release the Optics Hand Controller.

79. Perform the following calculations:

a. Increasing Shaft Δ angle = Row 1, step 77 minus Row 1, step 73.
b. Decreasing Shaft Δ angle = Row 1, step 78 minus Row 1, step 73.

80. Hold the Optics Hand Controller to the upper limit and record the contents of Row 2 on the DSKY. Release the Optics Hand Controller.

81. Hold the Optics Hand Controller to the lower limit and record the contents of Row 2 on the DSKY. Release the Optics Hand Controller.

82. Perform the following calculations:

a. Increasing Trunnion Δ angle = Row 2, step 80 minus Row 2, step 73.
b. Decreasing Trunnion Δ angle = Row 2, step 81 minus Row 2, step 73.

83. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00002 ENTR

NOTE: Step 84 applies only when Restart Monitor module (2898989) is installed.

84. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

---

85. Press to extinguish OPTICS POWER ON pushbutton on the Test Control panel.

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike locking handles.

86. Return the G&N Mounting Fixture to the 32.5° position.

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EQUIPMENT TEST
DATA SHEET 1 OF 5

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NO. 12213
REV. W
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	▨		▨	▨	▨
41A	TRN CDU FINE ERROR	V rms	▨		▨	▨	▨
41B	TRN CDU FINE ERROR (41 + 41A)	V rms	0.02		0.15		
46	SCT TRUN MDA TACH MON	V rms	▨		▨		
47	SCT TRUN MDA TACH MON	V rms	▨		▨		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 5

JDC
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
47 (cont)	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
47A	SCT TRUN MDA TACH MON	V rms	▨		▨		
47B	SCT TRUN MDA TACH MON (AVERAGE VALUE)	V rms	0.005		0.013		
57	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
59	SXT SHAFT MDA TACH MON (CHANNEL 1)	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON (CHANNEL 3)	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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FORM 0143
Chg. 7-23-65

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
61 (cont)	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
63.a	Shaft angle	deg	▨	( )_ _ _ . _ _	▨		
63.b	Trunnion angle	deg	▨	( )_ _ . _ _ _	▨		
63.c	Time	sec	▨	_ _ _ . _ _	▨		
64.a	Shaft angle	deg	▨	( )_ _ _ . _ _	▨		
64.b	Trunnion angle	deg	▨	( )_ _ . _ _ _	▨		
64.c	Time	sec	▨	_ _ _ . _ _	▨		
66.a	Δ Shaft angle	deg	▨		▨		
66.b	Δ Trunnion angle	deg	▨		▨		
66.c	Δ Time	sec	▨		▨		
66.d	Shaft drift rate	deg/sec	-0.0333		+0.0333		
66.e	Trunnion drift rate	deg/sec	-0.0167		+0.0167		
71	Row 1, Shaft Angle	deg	▨	( )_ _ _ _ _	▨		
71	Row 2, Trunnion Angle	deg	▨	( )_ _ _ _ _	▨		
73	Row 1, Shaft Angle	deg	▨	( )_ _ _ _ _	▨		
74.a	Shaft Commanded Angle	deg	9.65		11.65		
74.b	Trunnion Commanded Angle	deg	2.40		2.92		
77	Inc. Shaft Angle	deg	▨	( )_ _ _ _ _	▨		
78	Dec. Shaft Angle	deg	▨	( )_ _ _ _ _	▨		
79.a	Inc. Shaft Δ Angle	deg	1.14		2.12		

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EQUIPMENT TEST
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
79.b	Dec. Shaft Δ Angle	deg	1.14		2.12		
80	Inc. Trunnion Angle	deg	▨	( )_ _ _ _ _	▨		
81	Dec. Trunnion Angle	deg	▨	( )_ _ _ _ _	▨		
82.a	Inc. Trunnion Δ Angle	deg	0.28		0.52		
82.b	Dec. Trunnion Δ Angle	deg	0.28		0.52		

JDC ITEM NO.	CALCULATIONS
66.a	Δ Shaft angle = step 64.a - step 63.a Δ Shaft angle =
66.b	Δ Trunnion angle - step 64.b - step 63.b Δ Trunnion angle =
66.c*	Δ Time = step 64.c - step 63.c Δ Time =
66.d	Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$ Shaft drift rate =
66.e	Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$ Trunnion drift rate =

* If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

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JOB OPTICS SLEW RATE TEST

INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30305	2-5	3,4	EA	WS
B	11-10-66	31891	1, 6	-	EA	-
C	11-15-66	31942	1, 6	-	EA	-
D	1-12-67	32621	1, 4	-	EA	-
E	2-2-67	32883	All	2	EA	-
F	3-2-67	33103	-	2	EA	-
G	5-4-67	33719	-	3	EA	-
H	6-6-67	33910	4	-	EA	-
J	9-6-67	34560	1	-	EA	-
K	9-22-67	34704	4, 5, 6	2, 3, 4	EA BD	-
L	10-5-67	34806			EA BD	-
M	12-7-67	35208	7, 8	4, 5	EA	-
N	1-16-68	35450	5	2, 3	EA BD	-
P	2-29-68	35771	4, 5, 6	-	EA BD	-
R	4-29-68	36124	1, 2, 5, 6	2, 3	EA BD	-
S	7-11-68	36514	1, 8	-	EA	-
T	9-12-68	36819	1, 8	-	EA BD	-
U	10-21-68	36930	6	5	EA	-
V	3-11-69	37404	5	2	EA JF	-
W	5-26-70	38124	1, 8, 9, 10	4, 5	EA	-
Y	3-26-71	38393	7, 8, 9	4	EA JF	-

REFERENCES
PS-2015000

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: 1. Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike crade locking handles.

2. The G&N Mounting Fixture shall be set at the 90.0° position. Care must be taken to prevent gimbal lock (see JDC 12215).

3. Oscillograph Amplifier sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

NOTE: Step 3 applies to Indicator Control panel 2021290 only.

3. Set switches on Indicator Control panel as follows:

a. OPTICS ZERO to OFF
b. OPTICS TEL TRUN to SLAVE TO SXT
c. OPTICS COUPLING to DIRECT
d. OPTICS MODE to MAN
e. OPTICS SPEED to HI

NOTE: Step 3A applies to all Indicator Control panels except 2021290.

3A. Set switches on Indicator Control panel,

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB OPTICS SLEW RATE TEST

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SUBSYSTEM G AND N SYSTEM

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as follows:

a. OPTICS MODE to MAN
b. OPTICS CONTROLLER SPEED to HI
c. OPTICS CONTROLLER COUPLING to DIRECT
d. OPTICS TRACKER to OFF
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

4. Insure CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 PH REFERENCE, and OPT 800 ~ TO PH GEN pushbuttons on Oscillograph Signal Selector panel are lighted.

5. Insure SCT TRUN, SXT SHAFT, and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

6. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 and CHANNEL 5 switch to 11 to monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2
b. SCT Trunnion MDA Tach Mon. on CHANNEL 5

7. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 14 to monitor the SXT Trunnion MDA Output Mon. on Oscilloscope.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel. Set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 MV/MM.

NOTE: Step 9 applies to Indicator Control panel 2021290 only.

9. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 9A applies to all Indicator Control panels except 2021290.

9A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the upper limit not longer than 5 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. signal on CHANNEL 1.

13. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 MV/MM.

14. Set SCOPE "A" INPUT switch on Primary Signal Selector panel to SIG 1 and

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SUBSYSTEM G AND N SYSTEM

ASSY

CROSSBAR CONTROL to 14 to monitor the SXT Shaft MDA Output Mon. on Oscilloscope.

14A. Using the Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 15 applies to Indicator Control panel 2021290 only.

15. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 15A applies to all Indicator Control panels except 2021290.

15A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

16. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics Hand Controller to the right limit not longer than 10 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

21. Hold Optics Hand Controller to the left limit not longer than 10 seconds. Release Optics Hand Controller.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in-phase voltage of the SCT Trunnion MDA Tach Mon.

NOTE: Step 24 applies to Indicator Control panel 2021290 only.

24. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to MED.

NOTE: Step 24A applies to all Indicator Control panels except 2021290.

24A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to MED.

25. Measure and record the voltage indicated on the PAVM while holding the Optics

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SUBSYSTEM G AND N SYSTEM

ASSY

Hand Controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEEDS 20 pushbutton on the Oscillograph Control Panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the lower limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Deleted.

31. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA Tach Mon.

NOTE: Step 32 applies to Indicator Control panel 2021290 only.

32. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 32A applies to all Indicator Control panels except 2021290.

32A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the right limit not longer than 20 seconds. Release the Optics Hand Controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics Hand Controller to the left limit not longer than 20 seconds. Release the Optics Hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on

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CHANNEL 1 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

38. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

39. Set the DEGREES dial on the PAVM to 50.

NOTE: Step 40 applies to Indicator Control panel 2021290 only.

40. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS SPEED switch to LO.

NOTE: Step 40A applies to all Indicator Control panels except 2021290.

40A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

41. Measure and record the steady state voltage and sign indicated on the PAVM while holding Optics Hand Controller to the upper limit.

41A. Measure and record the steady state voltage and sign indicated on the PAVM while holding Optics Hand Controller to the lower limit.

41B. Release Optics Hand Controller. Add the absolute value recorded in step 41 to the absolute value recorded in step 41A. Record the result.

42. Set the DEGREES dial on the PAVM to 0.

43. Set VOLTMETER INPUT PAVM switch to SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

44. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2

b. SCT Trun MDA Tach Mon. on CHANNEL 5

45. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

46. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to the upper limit until the SXT Trunnion reaches 85° LOS as indicated by the Trunnion TPAC. Release the Optics Hand Controller.

47. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifier to OFF. Record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

47A. Measure and record the steady state voltage indicated on PAVM while holding Optics Hand Controller to lower limit. Release Optics Hand Controller.

47B. Add the absolute value recorded in step 46 to the absolute value recorded in step 47A and divide by two. Record results as average value of SCT Trun MDA Tach Mon.

48. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 12 to monitor SXT Shaft MDA Tach Mon. signal on CHANNEL 1.

49. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

50. Using the Optics Hand Controller with the OPTICS SPEED switch set to HI, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 51 applies to Indicator Control panel 2021290 only.

51. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 51A applies to all Indicator Control panels except 2021290.

51A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

52. Connect the PSA TPA #2 output TB3-32 (RED) HI and TB3-28 (BLK) LO to the Buffered Probe input J7 HI and J8 LO.

53. On the AUX INPUT PANEL, connect the Buffered Probe output to the Channel 3 AC input, to monitor the SCT Shaft MDA TACH Mon. signal on CHANNEL 3. Set the CHANNEL 3 switch on the AUX INPUT PANEL to OSS 800 cps. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 15.

54. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 3 sensitivity to 5 MV/MM on Oscillograph Amplifier panel.

55. Holding the Optics Hand Controller to the left with the OPTICS SPEED switch set to HI, position the SXT Shaft to (-180° ± 1°) indicated by the Shaft TPAC. Return the OPTICS SPEED SWITCH to LO.

56. Start the Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

57. Measure and record the steady state voltage indicated on the PAVM while holding the Optics Hand Controller to right limit. Continue holding Optics Hand Controller to right limit until SXT Shaft reaches +180° as indicated by the Shaft TPAC.

58. Release the Optics Hand Controller and set CHART DRIVE switch to OFF.

59. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indications of CHANNEL 1 and CHANNEL 3 per Figure 1. Record the maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 and CHANNEL 3 per Figure 1.

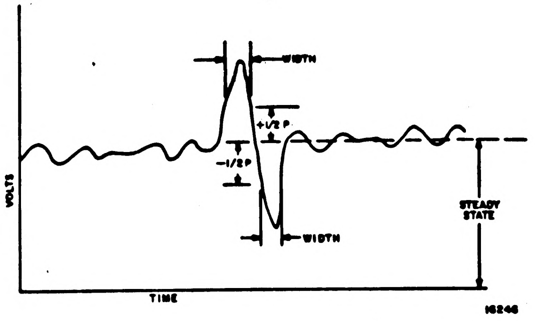

Figure 1. Signal Characteristics Diagram

NOTE: Step 60 applies to Indicator Control panel 2021290 only.

60. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

NOTE: Step 60A applies to all Indicator Control panels except 2021290.

60A. Set OPTICS MODE switch on Indicator Control panel to ZERO. Wait 20 seconds before proceeding.

61. Set CROSSBAR CONTROL on Primary Signal Selector panel to the following positions and measure the quadrature voltage indicated on the PAVM.

	Signal	CROSSBAR CONTROL
a.	SCT Trun MDA P/A Mon.	103
b.	SXT Shaft MDA P/A Mon.	203
c.	SXT Trun MDA P/A Mon.	106
d.	SCT Shaft MDA P/A Mon.	210

NOTE: Step 62 applies to Indicator Control panel 2021290 only.

62. Set OPTICS ZERO switch on Indicator Control panel to OFF. Set OPTICS CONTROLLER SPEED switch to LO.

NOTE: Step 62A applies to all Indicator Control panels except 2021290.

62A. Set OPTICS MODE switch on Indicator Control panel to MAN. Set OPTICS CONTROLLER SPEED switch to LO.

63. Press MARK pushbutton. Observe DSKY displays VERB 06 NOUN 56 and data in the following form:

a. Row 1 = ±XXX.XX (Shaft angle in degrees)

b. Row 2 = ±XX.XXX (Trunnion angle in degrees)

c. Row 3 = XXX.XX (Time in seconds)

Record Row 1, Row 2, and Row 3 indications.

64. Approximately 60 seconds after first mark, press MARK pushbutton again and record new Row 1, Row 2, and Row 3 indications.

NOTE: Step 65 applies to Indicator Control panel 2021290 only.

65. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 65A applies to all Indicator Control panels except 2021290.

65A. Set OPTICS MODE switch on Indicator Control panel to ZERO.

CALCULATIONS

66. Perform the following calculations for hand controller drift rates:

a. Δ Shaft angle = step 64.a - step 63.a

b. Δ Trunnion angle = step 64.b - step 63.b

NOTE: If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

c. Δ Time = step 64.c - step 63.c

d. Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$

e. Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$

NOTE: Steps 67 through 83 apply only if the Indicator Control panel has ECP 792 installed.

COMPUTER AIDED OPTICS TRACKING

67. Set OPTICS ZERO switch on Indicator Control panel to OFF.

68. Set OPTICS MODE switch on Indicator Control panel to CMC and perform the following DSKY operations:

a.	VERB 41	NOUN 55	ENTR
b.	+00000		ENTR
c.	+00000		ENTR

69. Set OPTICS MODE switch on Indicator Control panel to MAN.

NOTE: Step 70 must be completed within one minute after completing step 69.

70. Perform the following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00012		ENTR
c.	00002		ENTR
d.	VERB 16	NOUN 55	ENTR

NOTE: In step 71, display may cycle one ECDU bit (R1= ± 000. 01°; R1= ± 00. 003°). Record display for larger positive or negative incremental difference from 00000.

71. When DSKY display settles out, record the contents of Row 1 and Row 2.

72. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. 00053 ENTR
c. 00360 ENTR
d. 00360 ENTR
e. VERB 21 NOUN 10 ENTR
f. 00012 ENTR
g. 00002 ENTR ENTR
h. 00014 ENTR
i. 06000 ENTR
j. Press KEY RELEASE

73. When DSKY display settles out, record the contents of Row 1 and Row 2.

74. Perform the following calculations:

a. Shaft = Row 1, step 73 minus Row 1, step 71.
b. Trunnion = Row 2, step 73 minus Row 2, step 71.

75. Set OPTICS SPEED switch on Indicator Control panel to MED.

76. Set OPTICS COUPLING switch on Indicator Control panel to DIRECT.

77. Hold the Optics Hand Controller to the right limit and record the contents of Row 1 on the DSKY. Release the Optics Hand Controller. ______

78. Hold the Optics Hand Controller to the left limit and record the contents of Row 1 on the DSKY. Release the Optics Hand Controller. ______

79. Perform the following calculations:

a. Increasing Shaft Δ angle = Row 1, step 77 minus Row 1, step 73.
b. Decreasing Shaft Δ angle = Row 1, step 78 minus Row 1, step 73.

80. Hold the Optics Hand Controller to the upper limit and record the contents of Row 2 on the DSKY. Release the Optics Hand Controller.

81. Hold the Optics Hand Controller to the lower limit and record the contents of Row 2 on the DSKY. Release the Optics Hand Controller.

82. Perform the following calculations:

a. Increasing Trunnion Δ angle = Row 2, step 80 minus Row 2, step 73.
b. Decreasing Trunnion Δ angle = Row 2, step 81 minus Row 2, step 73.

83. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00002 ENTR

NOTE: Step 84 applies only when Restart Monitor module (2898989) is installed.

84. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

---

85. Press to extinguish OPTICS POWER ON pushbutton on the Test Control panel.

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike locking handles.

86. Return the G&N Mounting Fixture to the 32.5° position.

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EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12213
REV. Y
INITIAL TDRR 29882

JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ (START) ______ (END) ______ (SITE / LOCATION)
TIME ______ (START) ______ (END) ______ (TOTAL ELAPSED)

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ (NAME/AFFILIATION) APPROVED BY ______ (NAME/AFFILIATION)

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12213
REV. Y

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m. sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M. sec.	▨		200		
41	TRN CDU FINE ERROR	V rms	▨		▨	▨	▨
41A	TRN CDU FINE ERROR	V rms	▨		▨	▨	▨
41B	TRN CDU FINE ERROR (41+41A)	V rms	0.02		0.15		
46	SCT TRUN MDA TACH MON	V rms	▨		▨		
47	SCT TRUN MDA TACH MON	V rms	▨		▨		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 5

JDC
NO. 12213
REV. Y

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
47 (cont)	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
47A	SCT TRUN MDA TACH MON	V rms	▨		▨		
47B	SCT TRUN MDA TACH MON (AVERAGE VALUE)	V rms	0.005		0.013		
57	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
59	SXT SHAFT MDA TACH MON (CHANNEL 1)	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
59	SCT SHAFT MDA TACH MON (CHANNEL 3)	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	▨		0.8		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 5

JDC
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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
61 (cont)	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	▨		0.8		
63.a	Shaft angle	deg	▨	( ) _ _ _ . _ _	▨		
63.b	Trunnion angle	deg	▨	( ) _ _ . _ _ _	▨		
63.c	Time	sec	▨	_ _ _ . _ _	▨		
64.a	Shaft angle	deg	▨	( ) _ _ _ . _ _	▨		
64.b	Trunnion angle	deg	▨	( ) _ _ . _ _ _	▨		
64.c	Time	sec	▨	_ _ _ . _ _	▨		
66.a	Δ Shaft angle	deg	▨		▨		
66.b	Δ Trunnion angle	deg	▨		▨		
66.c	Δ Time	sec	▨		▨		
66.d	Shaft drift rate	deg/sec	-0.0333		+0.0333		
66.e	Trunnion drift rate	deg/sec	-0.0167		+0.0167		
71	Row 1, Shaft Angle	deg	▨	( )_____	▨		
71	Row 2, Trunnion Angle	deg	▨	( )_____	▨		
73	Row 1, Shaft Angle	deg	▨	( )_____	▨		
73	Row 2, Trunnion Angle	deg	▨	( )_____	▨		
74.a	Shaft Commanded Angle	deg	9.65		11.65		
74.b	Trunnion Commanded Angle	deg	2.40		2.92		
77	Inc. Shaft Angle	deg	▨	( )_____	▨		
78	Dec. Shaft Angle	deg	▨	( )_____	▨		
79.a	Inc. Shaft Δ Angle	deg	1.14		2.12		

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EQUIPMENT TEST
DATA SHEET 5 **OF** 5

JDC
NO. 12213
REV. Y

JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
79.b	Dec. Shaft Δ Angle	deg	1.14		2.12		
80	Inc. Trunnion Angle	deg	▨	( )_____	▨		
81	Dec. Trunnion Angle	deg	▨	( )_____	▨		
82.a	Inc. Trunnion Δ Angle	deg	0.28		0.52		
82.b	Dec. Trunnion Δ Angle	deg	0.28		0.52		

JDC ITEM NO.	CALCULATIONS
66.a	Δ Shaft angle = step 64.a - step 63.a Δ Shaft angle =
66.b	Δ Trunnion angle - step 64.b - step 63.b Δ Trunnion angle =
66.c*	Δ Time = step 64.c - step 63.c Δ Time =
66.d	Shaft drift rate = $\frac{\Delta \text{ Shaft angle}}{\Delta \text{ Time}}$ Shaft drift rate =
66.e	Trunnion drift rate = $\frac{\Delta \text{ Trunnion angle}}{\Delta \text{ Time}}$ Trunnion drift rate =

* If step 64.c is less than step 63.c, add 163.84 seconds to step 64.c.

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JOB OPTICS SLEW RATE TEST | JDC 12213 REV. - PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G AND N SYSTEM | ASSY.

DESCRIPTION The test demonstrates slewing performance of the optics servo loops.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: OSCILLOGRAPH AMPLIFIER sensitivities stated herein are nominal and may be adjusted at the discretion of the operator.

INITIALIZATION

1. Establish a Master Initialization condition.

2. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and the TRACKER switch is set to OFF.

3. Insure that CH4 AC, CH5 AC, CH6 AC, 800 ~ 0 RH REFERENCE and OPT 800 ~ PH GEN pushbuttons on oscillograph signal selector panel are lighted and SCT TRUN, SXT SHAFT and SXT TRUN switches on PSA Test Point Adapter are set to 1:1.

HIGH SPEED SLEW RATE

4. Set the CHANNEL 2 switch on the Oscillograph signal selector panel to 12 and CHANNEL 5 switch to 11, and monitor the following signals:

a. SXT Trunnion MDA Tach Mon. on CHANNEL 2.

b. SCT Trunnion MDA Tach Mon. on CHANNEL 5.

5. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT SHAFT ANGLE Displayed on Row 1.

c. Observe SXT TRN LOS Angle Displayed Row 2.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

6. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

7. Press CHART SPEEDS 5 pushbutton on the Oscillograph control panel and set CHANNEL 2 sensitivity on the Oscillograph Amplifier panel to 500 MV/MM and CHANNEL 5 sensitivity to 200 mv/mm.

8. Set SCOPE "A" INPUT to SIG 2 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Trunnion MDA Output Mon. on Oscilloscope.

9. Set CONTROLLER COUPLING switch to DIRECT, CONTROLLER SPEED to HI, and after DSKY displays all zeroes on Row 1 and Row 2, set OPTICS MODE switch to MAN on Indicator Control panel.

10. Start oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

11. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the upper limit not longer than 10 seconds. Release the Optics hand Controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record maximum steady state indications of CHANNELS 2 and 5.

12. Set OPTICS MODE switch to ZERO.

13. Set CHANNEL 1 to 13 on the Oscillograph signal selector panel to monitor the following signals:

a. SCT Shaft MDA Tach Mon. on CHANNEL 1.

14. Set CHANNEL 1 sensitivity on Oscillograph Amplifier panel to 500 mv/mm.

15. Set SCOPE "A" INPUT to SIG 1 and CROSSBAR CONTROL to 14 on Primary Signal Selector panel to monitor SXT Shaft MDA Output Mon. on Oscilloscope.

16. After the DSKY displays all zeroes on Row 1 and Row 2, set the OPTICS MODE switch to MANUAL on the Indicator Control panel. Start the Oscillograph by setting CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

17. Measure and record the steady state peak to peak voltage indicated on the Oscilloscope while holding the Optics hand controller to the right limit not longer than 10 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record the maximum steady state indications of CHANNEL 1.

18. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 12 to monitor the SXT Shaft MDA Tach Mon. voltage on CHANNEL 1.

19. Set CHANNEL 1 sensitivity to 500 mv/mm on the Oscillograph Amplifier panel.

20. Start the Oscillograph by setting the CHART DRIVE switch on the Oscillograph Control to MM/SEC.

21. Hold the Optics hand controller to the left limit not longer than 10 seconds. Release the Optics hand controller and set OPTICS MODE switch to ZERO.

22. Stop Oscillograph and record maximum steady state indication on CHANNEL 1.

MEDIUM SPEED SLEW RATE

23. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05. Set PAVM FUNCTION selector to 0° to monitor in phase voltage of the SCT Trunnion MDA TACH Mon.

24. Set the CONTROLLER SPEED to MED and after the DSKY displays all zeroes on Row 1 and Row 2, set the OPTICS MODE switch to MAN on the Indicator Control panel.

25. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit not longer than 20 seconds. Release the Optics hand controller.

26. Set CHANNEL 5 switch to 11 on Oscillograph Signal Selector panel to monitor the SCT Trunnion MDA TACH Mon.

27. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 09 to monitor the SXT Trunnion MDA TACH Mon.

28. Set CHANNEL 5 sensitivity to 10 MV/MM on Oscillograph Amplifier panel. Press CHART SPEED 20 pushbutton on the Oscillograph control panel and set CHART DRIVE switch to MM/SEC.

29. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 5 per Figure 1. If no pulses occur, write none on the data sheet.

30. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

31. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 04 to monitor the SCT Shaft MDA TACH Mon.

32. After the DSKY displays all zeroes on Row 1 and Row 2, set OPTICS MODE switch on Indicator Control panel to MAN.

33. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the right limit not longer than 20 seconds. Release the Optics hand controller.

34. Set CHANNEL 1 switch to 13 on Oscillograph Signal Selector panel to monitor the SCT Shaft MDA TACH Mon.

35. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 07 to monitor the SXT Shaft MDA Tach Mon.

36. Set CHANNEL 1 sensitivity to 20 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

37. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the left limit not longer than 20 seconds. Release the Optics hand controller and set CHART DRIVE switch to OFF. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNEL 4 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNEL 4 per Figure 1. If no pulses occur, write none on the data sheet.

LOW SPEED SLEW RATE

28. Set OPTICS MODE switch to ZERO and CONTROLLER SPEED switch to LO on Indicator Control panel.

39. Set the CHANNEL 2 switch to 12 and the CHANNEL 5 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Trun MDA Tach Mon. on CHANNEL 2.

b. SCT Trun MDA Tach Mon. on CHANNEL 5.

40. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 06 to monitor the CDU Trunnion Fine Error.

41. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

42. Set OPTICS MODE switch on the Indicator Control panel to MAN after the DSKY displays all zeroes on Row 1 and Row 2.

43. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the upper limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value of +90° on Row 2 of the DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to upper limit.

44. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL to 06. Measure and record the SXT TRUN MDA P/A voltage indicated on the PAVM. Release the Optics hand controller.

45. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

46. Set VOLTMETER INPUT to PAVM SIG 1 and CROSSBAR CONTROL to 05 to monitor the SCT Trunnion MDA Tach Mon.

47. Set CHANNEL 2 sensitivity to 10 MV/MM and CHANNEL 5 sensitivity to 5 MV/MM on Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

48. Measure and record the voltage indicated on the PAVM while holding the Optics hand controller to the lower limit until the SXT is against the Trunnion stop as indicated by a nominal (unchanging) value of -5° on Row 2 of the DSKY. Release the Optics hand controller.

49. Set all sensitivities on Oscillograph Amplifier panel to OFF and record steady state indication of CHANNELS 2 and 5 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points on CHANNELS 2 and 5 per Figure 1.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

51. Set the CHANNEL 1 switch to 12 and the CHANNEL 6 switch to 11 on the Oscillograph Signal Selector panel to monitor:

a. SXT Shaft MDA Tach Mon on CHANNEL 1.

52. Set VOLTMETER INPUT to PAVM SIG 2 and CROSSBAR CONTROL to 05 to monitor the CDU Shaft Fine Error.

53. Set CHANNEL 1 sensitivity to 10 MV/MM and CHANNEL 6 sensitivity to 2 MV/MM on the Oscillograph Amplifier panel and set CHART DRIVE switch to MM/SEC.

54. After all zeroes are indicated in rows 1 and 2 of the DSKY, set the OPTICS MODE switch on the Indicator Control panel to MAN.

55. Measure and record voltage indicated on PAVM while holding Optics hand controller to right limit until SXT is against Shaft stop as indicated by a nominal (unchanging) value of +270° on Row 1 of DSKY. Set CHART DRIVE switch to OFF and continue holding the Optics hand controller to right limit.

56. Set the VOLTMETER INPUT switch to PAVM SIG 2 and the CROSSBAR CONTROL to 03. Measure and record the SXT Shaft MDA P/A voltage on the PAVM. Release the Optics hand controller.

57. Set all sensitivities on Oscillograph Amplifier to OFF and record steady state indication of CHANNEL 1 per Figure 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

58. Set the CHANNEL 1 switch on the Oscillograph Signal Selector panel to 13 to monitor the SCT Shaft MDA Tach Mon. on CHANNEL 1 of the Oscillograph.

59. Set the CHANNEL 1 sensitivity control on the Oscillograph Amplifier panel to 5

MV/MM and set the CHART DRIVE switch on the Oscillograph control panel to MM/SEC.

60. Hold Optics hand controller to left limit until SXT is against shaft stop as indicated by a nominal (unchanging) value of -270° on Row 1 of DSKY. Release Optics hand controller and set the CHART DRIVE switch to OFF.

61. Set the CHANNEL 1 SENSITIVITY control on the Oscillograph Amplifier panel to OFF and record the maximum steady state indication on CHANNEL 1. Record maximum width of any pulses at 1/2 positive peak or 1/2 negative peak points of CHANNEL 1 per Figure 1.

62. Set the OPTICS MODE switch on the indicator control panel to ZERO.

63. Set the CROSSBAR CONTROL to the following positions and measure the quadrature voltage indicated on the PAVM after a minimum of 20 seconds have elapsed since initiating step 62. Insure that the Telescope Trunnion switch is in the SLAVE to SXT position.

	Signal	CROSSBAR CONTROL
a.	SCT Trun MDA P/A Mon.	103
b.	SXT Shaft MDA P/A Mon.	203
c.	SXT Trun MDA P/A Mon.	106
d.	SCT Shaft MDA P/A Mon.	210

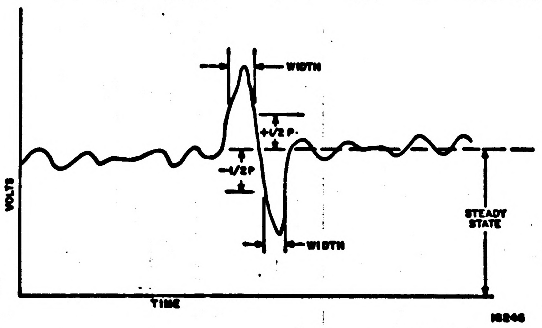

Figure 1. Signal Characteristics Diagram

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JOB OPTICS SLEW RATE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	SXT TRN MDA OUTPUT MON (OSC)	V p-p	13		23		
	SXT TRN MDA TACH MON (CH 2)	V rms	2.0		4.6		
	SCT TRN MDA TACH MON (CH 5)	V rms	0.5		1.2		
17	SXT SHAFT MDA OUTPUT MON (OSC)	V p-p	13		23		
	SCT SHAFT MDA TACH MON (CH 1)	V rms	2.0		4.6		
22	SXT SHAFT MDA TACH MON	V rms	2.0		4.6		
25	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
29	SXT TRN MDA TACH MON	V rms	0.20		0.46		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29 (cont)	SCT TRN MDA TACH MON PULSE WIDTH	m.sec.	▨		200		
	SCT TRUN MDA TACH MON	V rms	0.05		0.12		
33	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
37	SXT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH MON	V rms	0.20		0.46		
	SCT SHAFT MDA TACH PULSE WIDTH	M.sec.	▨		200		
43	TRN CDU FINE ERROR	V rms	0.02		0.1		
44	SXT TRUN MDA P/A MON	V rms	0.9		1.9		
45	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN TACH MON PULSE WIDTH	m.sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m.sec.	▨		250		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
49	SCT TRUN MDA TACH MON	V rms	0.005		0.012		
	SCT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
	SXT TRUN MDA TACH MON	V rms	0.020		0.046		
	SXT TRUN MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
55	SHAFT CDU FINE ERROR	V rms	0.02		0.1		
56	SXT SHAFT MDA P/A MON	V rms	0.9		1.9		
57	SXT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SXT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
61	SCT SHAFT MDA TACH MON	V rms	0.020		0.046		
	SCT SHAFT MDA TACH MON PULSE WIDTH	m. sec.	▨		250		
63	SCT TRUN P/A QUADRATURE VOLTAGE	V rms	0.1		0.8		

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JOB OPTICS SLEW RATE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63 (cont)	SXT SHAFT P/A QUADRATURE VOLTAGE	V rms	0.1		0.8		
	SXT TRUN P/A QUADRATURE VOLTAGE	V rms	0.1		0.8		
	SCT SHAFT P/A QUADRATURE VOLTAGE	V rms	0.1		0.8		

DATE 12 AUG 65

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JOB OPTICS POSITIONAL ACCURACY TEST
INITIAL TDRR 29882 D.S. PGS 9

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA 7/	WS 7/

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT Shaft Angle Displayed on Row 1

c. Observe SXT TRN LOS Angle Displayed on Row 2

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 and set VDW dial to zero. Sight through SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Set the OPTICS MODE switch on the Indicator Control panel to MAN. Pushing the Optics hand controller to the left, drive the SXT until Row 1 of the DSKY indicates 27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates 27000 and Row 2 indicates the value recorded in step 4, line (a).

7. Cover the SXT StLOS and sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the dial reading of the VDW on line (c). Uncover StLOS.

8. Cover the SXT LLOS and repeat step 7 for the SXT StLOS while maintaining a DSKY Row 2 indication of step 4, line (a), and Row 1 indication of 27000 by manipulating the Optics hand controller. Record VDW reading on line (e). Complete lines (d), (f) and (g).

9. Set OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

10. Complete lines (i) (j) and (k) on the Data Sheet. Set the CONTROLLER SPEED switch to HI.

11. Repeat step 6.

12. Set the VDW to value recorded on line (c). Sight through the SXT eyepiece and viewing along the LLOS, insure that the SXT vertical reticle line and target number 1 reticle dot (or vertical reticle line) are coincident.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the CONTROLLER SPEED switch on the Indicator Control panel to HI and using the Optics hand controller, drive the SXT until Row 2 of the DSKY indicates 45000. Return the CONTROLLER SPEED switch to LO.

16. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the NAV DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts

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are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (n).

21. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the NAV DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the NAV DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the NAV DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics hand controller vertically to position the SXT StLOS until the

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central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the NAV DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the NAV DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the NAV DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw). Enter VERB 16 NOUN 55 and press ENTR on the Nav DSKY.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics hand controller, drive the SXT until Row 1 of the DSKY indicates 27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates 27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the

horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI and using the Optics hand controller, drive the SXT until Row 1 of the NAV DSKY indicates +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 of the DSKY indicates 270.00°.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics hand controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines on target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics hand controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC
NO. 12214
REV. A
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END SITE / LOCATION ____
TIME ____ START ____ END TOTAL ELAPSED ____

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-0007	( ) ____	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ____	+00002			(b)
7	VDW Reading of WLLOS	deg min	▨	____ ____	▨			(c)
8	Convert line (c) to sec using Calibration chart	sec	▨	( ) ____	▨			(d)
	VDW Reading of WSTLOS	deg min	▨	____ ____	▨			(e)
	Convert line (e) to sec using calibration chart	sec	▨	( ) ____	▨			(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC
NO. 12214
REV. A

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) StLOS-LLOS Parallelism	sec	-15	( ) ____	+15			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨	____ ____ ____	▨	▨	▨	(h)
10	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ____	▨	▨	▨	(i)
	Calculate: Line (i) + Line (d)	sec	▨	( ) ____	▨	▨	▨	(j)
	Convert Line (j) to VDW reading using calibration chart **	deg min	▨	____ ____	▨	▨	▨	(k)
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	(l)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
** If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12214
REV. A

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17 (cont)		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	
18	Select bit count 45°	bits	16382	____	16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( ) ____	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart	deg min	▨	____ ____	▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	(p)
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits	▨		▨	▨	▨	(q)
24	Calculate: Line (m) +00009 bits	bits	▨	( )	▨	▨	▨	(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( )	+2			(s)
	Calculate: Line (j) +30 sec	sec	▨	( )	▨	▨	▨	(t)
	Convert Line (t) to VDW reading using calibration chart	deg min	▨		▨	▨	▨	(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	(v)
		Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
REV. A

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits	▨		▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( )	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( )	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( )	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart	deg min	▨		▨	▨	▨	(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	(ab)
		Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	
33	Select bit count 45° (±60")	bits	▨		▨	▨	▨	(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO. 12214
REV. A

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits	▨	( )	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( )	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( )	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart	deg min	▨		▨	▨	▨	(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	(ah)
		Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC
NO. 12214
REV. A

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨		▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( )	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( )	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( )	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart	deg min	▨		▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	(an)
		Row 2 deg bits	▨	— — . — — — —	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC
NO. 12214
REV. A

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	________	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( )________	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( )________	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( )________	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	(at)
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
REV. A

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
48	Select bit count 45° (-60)')	bits	▨	________	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( )________	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( )________	+2			(aw)
53	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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INITIAL TDRR 29882 D.S. PGS. 9

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
Ⓜ A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT Shaft Angle Displayed on Row 1

c. Observe SXT TRN LOS Angle Displayed on Row 2

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 and set VDW dial to zero. Sight through SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Set the OPTICS MODE switch on the Indicator Control panel to MAN. Pushing the Optics hand controller to the left, drive the SXT until Row 1 of the DSKY indicates 27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates 27000 and Row 2 indicates the value recorded in step 4, line (a).

7. Cover the SXT StLOS and sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the dial reading of the VDW on line (c). Uncover StLOS.

8. Cover the SXT LLOS and repeat step 7 for the SXT StLOS while maintaining a DSKY Row 2 indication of step 4, line (a), and Row 1 indication of 27000 by manipulating the Optics hand controller. Record VDW reading on line (e). Complete lines (d), (f) and (g).

9. Set OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

10. Complete lines (i) (j) and (k) on the Data Sheet. Set the CONTROLLER SPEED switch to HI.

11. Repeat step 6.

12. Set the VDW to value recorded on line (c). Sight through the SXT eyepiece and viewing along the LLOS, insure that the SXT vertical reticle line and target number 1 reticle dot (or vertical reticle line) are coincident.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the CONTROLLER SPEED switch on the Indicator Control panel to HI and using the Optics hand controller, drive the SXT until Row 2 of the DSKY indicates 45000. Return the CONTROLLER SPEED switch to LO.

16. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the NAV DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts

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are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (n).

21. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the NAV DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the NAV DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the NAV DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics hand controller vertically to position the SXT StLOS until the

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central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the NAV DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the NAV DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the NAV DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw). Enter VERB 16 NOUN 55 and press ENTR on the Nav DSKY.

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics hand controller, drive the SXT until Row 1 of the DSKY indicates 27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates 27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the

JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV B PAGE 5 OF 5

SUBSYSTEM G & N SYSTEM | ASSY

horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds, then set the OPTICS MODE switch to MAN and the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI and using the Optics hand controller, drive the SXT until Row 1 of the NAV DSKY indicates +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 of the DSKY indicates 270.00°.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics hand controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines on target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics hand controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

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EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC
NO. 12214
REV. B
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-0007	( )	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( )	+00002			(b)
7	VDW Reading of WLLOS	deg min	▨		▨			(c)
8	Convert line (c) to sec using Calibration chart	sec	▨	( )	▨			(d)
	VDW Reading of WSTLOS	deg min	▨		▨			(e)
	Convert line (e) to sec using calibration chart	sec	▨	( )	▨			(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC
NO. 12214
REV. B

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) StLOS-LLOS Parallelism	sec	-15	( )	+15			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨		▨	▨	▨	(h)
10	Calculate: 45° - line (h) to nearest second	sec	▨	( )	▨	▨	▨	(i)
	Calculate: Line (i) + Line (d)	sec	▨	( )	▨	▨	▨	(j)
	Convert Line (j) to VDW reading using calibration chart **	deg min	▨		▨	▨	▨	(k)
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	--.--- 	▨	▨	▨	(l)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
** If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12214
REV. B

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17 (cont)		Row 2 deg bits	▨	--.--- 	▨	▨	▨	
		Row 2 deg bits	▨	--.--- 	▨	▨	▨	
18	Select bit count 45°	bits	16382		16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( )	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart	deg min	▨		▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45°(+90")	Row 2 deg bits	▨	--.--- 	▨	▨	▨	(p)
		Row 2 deg bits	▨	--.--- 	▨	▨	▨	
		Row 2 deg bits	▨	--.--- 	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 4 **OF** 9

JDC
NO. 12214
REV. B

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits	▨		▨	▨	▨	(q)
24	Calculate: Line (m) +00009 bits	bits	▨	( ) ________	▨	▨	▨	(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ________	+2			(s)
	Calculate: Line (j) +30 sec	sec	▨	( ) ________	▨	▨	▨	(t)
	Convert Line (t) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	(v)
		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	
		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
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JDC
NO. 12214
REV. B

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits	▨	________	▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( ) ________	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ________	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( ) ________	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	(ab)
		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	
		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	
33	Select bit count 45° (±60")	bits	▨	________	▨	▨	▨	(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 6 **OF** 9

JDC
NO. 12214
REV. B

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits	▨	( ) ________	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) ________	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( ) ________	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	(ah)
		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	
		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
REV. B

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	________	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ________	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ________	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ________	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	(an)
		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
REV. B

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits		__ __ . __ __ __ __________				
43	Select bit count 45° (-90")	bits		__________				(ao)
44	Calculate: Line (m) -00009 bits	bits		( ) __________				(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) __________	+2			(aq)
	Calculate: Line (j) -60 sec	sec		( ) __________				(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min		__________ __________				(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		__ __ . __ __ __ __________				(at)
		Row 2 deg bits		__ __ . __ __ __ __________				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
REV. B

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits		__ __ . __ __ __ __________				
48	Select bit count 45° (-60)')	bits		__________				(au)
49	Calculate: Line (m) -00006 bits	bits		( ) __________				(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) __________	+2			(aw)
53	SCT (Offset 25°)			Reacted as Specified				
54	SCT Comparision (Offset 0°)			Reacted as Specified				
60	Image resolution		clear and distinct					
63	Image resolution		clear and distinct					

DATE 30 JUN 66

JOB OPTICS POSITIONAL ACCURACY TEST
JDC 12214 REV. C PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 11

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT Shaft Angle Displayed on Row 1

c. Observe SXT TRN LOS Angle Displayed on Row 2

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

10. Set the OPTICS MODE switch on the Indicator Control Panel to MAN. Pushing the Optics hand controller to the left, drive the SXT until Row 1 of the DSKY indicates 27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates 27000.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central verticle reticle line of SXT is coincident with dot and verticle reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the CONTROLLER SPEED switch on the Indicator Control panel to HI and using the Optics hand controller, drive the SXT until Row 2 of the DSKY indicates 45000. Return the CONTROLLER SPEED switch to LO.

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16. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the NAV DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (n).

21. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the NAV DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the NAV DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the NAV DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

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recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the NAV DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK push-button at the instant of coincidence.

42. Record the NAV DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the NAV DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw). Enter VERB 16 NOUN 55 and press ENTR on the Nav DSKY.

SUBSYSTEM G & N SYSTEM | ASSY

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics hand controller, drive the SXT until Row 1 of the DSKY indicates 27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates 27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds, then set the OPTICS MODE switch to MAN and the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI and using the Optics hand controller, drive the SXT until Row 1 of the NAV DSKY indicates +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 of the DSKY indicates 270.00°.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics hand controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics hand controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

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ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

71. Repeat step 66.

72. Repeat steps 67, 68, and 69.

73. Complete calculations for SXT StLOS to LLOS parallelism error.

74. Continue normal test sequence at step 9.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. C
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ ______ CAL DATE

NAME ____________ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-0007	( ) ________	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ________	+00002			(b)
7	VDW Reading of WLLOS	deg min	▨	________ ________	▨			(c)
8	Convert line (c) to sec using Calibration chart	sec	▨	( ) ________	▨			(d)
	VDW Reading of WSTLOS	deg min	▨	________ ________	▨			(e)
	Convert line (e) to sec using calibration chart	sec	▨	( ) ________	▨			(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) StLOS-LLOS Parallelism	sec	-15	( ) ________	+15			(g)
Imp	Transfer target calibration angle ∅3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨	________ ________ ________	▨	▨	▨	(h)
11	VDW Reading of WLLOS	deg min	▨	( ) ________	▨	▨	▨	(g.1)
	Convert line (g.1) to sec using Calibration chart	sec	▨	( ) ________	▨	▨	▨	(g.2)
12	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ________	▨	▨	▨	(i)
	Calculate: Line (i) + line (g.2)	sec	▨	( ) ________	▨	▨	▨	(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec	▨	________ ________	▨	▨	▨	(k)
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	__ __.__ __ __ ________	▨	▨	▨	(l)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC NO. 12214
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17 (cont)		Row 2 deg bits		_ _ . _ _ _ ______				
		Row 2 deg bits		_ _ . _ _ _ ______				
18	Select bit count 45°	bits	16382	______	16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( ) ______				(n)
	Convert Line (n) to VDW reading using calibration chart	deg min		______ ______				(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		_ _ . _ _ _ ______				(p)
		Row 2 deg bits		_ _ . _ _ _ ______				
		Row 2 deg bits		_ _ . _ _ _ ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC NO. 12214
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ______				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ______	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ______				(t)
	Convert Line (t) to VDW reading using calibration chart	deg min		______ ______				(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits		_ _ . _ _ _ ______				(v)
		Row 2 deg bits		_ _ . _ _ _ ______				
		Row 2 deg bits		_ _ . _ _ _ ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC NO. 12214
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		______				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) ______				(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ______	+2			(y)
	Calculate: Line (j) +60 sec	sec		( ) ______				(z)
	Convert Line (z) to VDW reading using calibration chart	deg min		______ ______				(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		_ _ . _ _ _ ______				(ab)
		Row 2 deg bits		_ _ . _ _ _ ______				
		Row 2 deg bits		_ _ . _ _ _ ______				
33	Select bit count 45° (±60")	bits		______				(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 11

JDC NO. 12214
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) ______				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) ______	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) ______				(af)
	Convert Line (af) to VDW reading using calibration chart	deg min		______ ______				(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		_ _ . _ _ _ ______				(ah)
		Row 2 deg bits		_ _ . _ _ _ ______				
		Row 2 deg bits		_ _ . _ _ _ ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 11

JDC
NO. 12214
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits		____				(ai)
39	Calculate: Line (m) -00003 bits	bits		( ) ____				(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ____	+2			(ak)
	Calculate: Line (j) -90 sec	sec		( ) ____				(al)
	Convert Line (al) to VDW reading using calibration chart	deg min		____ ____				(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		— — . — — — ____				(an)
		Row 2 deg bits		— — . — — — ____				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 11

JDC
NO. 12214
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits		— — . — — — ____				
43	Select bit count 45° (-90")	bits		____				(ao)
44	Calculate: Line (m) -00009 bits	bits		( ) ____				(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ____	+2			(aq)
	Calculate: Line (j) -60 sec	sec		( ) ____				(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min		____ ____				(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		— — . — — — ____				(at)
		Row 2 deg bits		— — . — — — ____				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 11

JDC
NO. 12214
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits		— — . — — — ____				
48	Select bit count 45° (-60)')	bits		____				(au)
49	Calculate: Line (m) -00006 bits	bits		( ) ____				(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ____	+2			(aw)
53	SCT (Offset 25°)			Reacted as Specified				
54	SCT Comparision (Offset 0°)			Reacted as Specified				
60	Image resolution		clear and distinct					
63	Image resolution		clear and distinct					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC
NO. 12214
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ____		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
71, 72	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00.0"		
73	$\frac{\Sigma\Delta(71, 72)}{\Sigma\Delta(67, 68)}$ = - ______ StLOS/LLOS Parallelism Tolerance: -15 minimum, + 15 maximum		

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FORM CO 48
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 **REV.** D **PAGE** 1 **OF** 6
INITIAL TDRR 29832 **D.S. PGS** 1

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-

REFERENCES PS 2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Press OPTICS POWER ON pushbutton on Test Control Panel. OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT Shaft Angle Displayed on Row 1

c. Observe SXT TRN LOS Angle Displayed on Row 2

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

10. Set the OPTICS MODE switch on the Indicator Control Panel to MAN. Pushing the Optics hand controller to the left, drive the SXT until Row 1 of the DSKY indicates 27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates 27000.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central verticle reticle line of SXT is coincident with dot and verticle reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the CONTROLLER SPEED switch on the Indicator Control panel to HI and using the Optics hand controller, drive the SXT until Row 2 of the DSKY indicates 45000. Return the CONTROLLER SPEED switch to LO.

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16. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (n).

21. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

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33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw). Enter VERB 16 NOUN 55 and press ENTR pushbutton on the DSKY.

JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV D PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics hand controller, drive the SXT until Row 1 of the DSKY indicates 27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates 27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds, then set the OPTICS MODE switch to MAN and the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI and using the Optics hand controller, drive the SXT until Row 1 of the DSKY indicates +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 of the DSKY indicates 270.00°.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics hand controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics hand controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

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SUBSYSTEM G & N SYSTEM | ASSY

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

71. Repeat step 66.

72. Repeat steps 67, 68, and 69.

73. Complete calculations for SXT StLOS to LLOS parallelism error.

74. Continue normal test sequence at step 9.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC NO. 12214
REV. D
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-0007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS	deg min		______ ______				(c)
8	Convert line (c) to sec using Calibration chart	sec		( ) ______				(d)
	VDW Reading of WSTLOS	deg min		______ ______				(e)
	Convert line (e) to sec using calibration chart	sec		( ) ______				(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) StLOS-LLOS Parallelism	sec	-15	( ) ______	+15			(g)
Imp	Transfer target calibration angle #3 from JDC 12223 Item C.1 to nearest whole second	deg min sec		______ ______ ______				(h)
11	VDW Reading of WLLOS	deg min		( ) ______				(g.1)
	Convert line (g.1) to sec using Calibration chart	sec		( ) ______				(g.2)
12	Calculate: 45° - line (h) to nearest second	sec		( ) ______				(i)
	Calculate: Line (i) + line (g.2)	sec		( ) ______				(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec		______ ______				(k)
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits		— — . — — — ______				(l)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 11

JDC
NO. 12214
REV. D

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17 (cont)		Row 2 deg bits		— — . — — — __________				
		Row 2 deg bits		— — . — — — __________				
18	Select bit count 45°	bits	16382	__________	16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( ) __________				(n)
	Convert Line (n) to VDW reading using calibration chart	deg min		__________ __________				(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		— — . — — — __________				(p)
		Row 2 deg bits		— — . — — — __________				
		Row 2 deg bits		— — . — — — __________				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 11

JDC
NO. 12214
REV. D

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) __________				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) __________	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) __________				(t)
	Convert Line (t) to VDW reading using calibration chart	deg min		__________ __________				(u)
27	Record CMC NAV DSKY Row 2 display *45° (+30")	Row 2 deg bits		— — . — — — __________				(v)
		Row 2 deg bits		— — . — — — __________				
		Row 2 deg bits		— — . — — — __________				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 **OF** 11

JDC
NO. 12214
REV. D

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		__________				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) __________				(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) __________	+2			(y)
	Calculate: Line (j) +60 sec	sec		( ) __________				(z)
	Convert Line (z) to VDW reading using calibration chart	deg min		__________ __________				(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		— — . — — — __________				(ab)
		Row 2 deg bits		— — . — — — __________				
		Row 2 deg bits		— — . — — — __________				
33	Select bit count 45° (±60")	bits		__________				(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 **OF** 11

JDC
NO. 12214
REV. D

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) __________				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) __________	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) __________				(af)
	Convert Line (af) to VDW reading using calibration chart	deg min		__________ __________				(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		— — . — — — __________				(ah)
		Row 2 deg bits		— — . — — — __________				
		Row 2 deg bits		— — . — — — __________				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 7 **OF** 11

JDC
NO. 12214
REV. D

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits		______				(ai)
39	Calculate: Line (m) -00003 bits	bits		( ) ______				(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ______	+2			(ak)
	Calculate: Line (j) -90 sec	sec		( ) ______				(al)
	Convert Line (al) to VDW reading using calibration chart	deg min		______ ______				(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		_ _ . _ _ _ ______				(an)
		Row 2 deg bits		_ _ . _ _ _ ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 8 **OF** 11

JDC
NO. 12214
REV. D

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits		_ _ . _ _ _ ______				
43	Select bit count 45° (-90")	bits		______				(ao)
44	Calculate: Line (m) -00009 bits	bits		( ) ______				(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ______	+2			(aq)
	Calculate: Line (j) -60 sec	sec		( ) ______				(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min		______ ______				(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		_ _ . _ _ _ ______				(at)
		Row 2 deg bits		_ _ . _ _ _ ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 9 **OF** 11

JDC
NO. 12214
REV. D

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits		_ _ . _ _ _ ______				
48	Select bit count 45° (-60)')	bits		______				(au)
49	Calculate: Line (m) -00006 bits	bits		( ) ______				(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ______	+2			(aw)
53	SCT (Offset 25°)			Reacted as Specified				
54	SCT Comparision (Offset 0°)			Reacted as Specified				
60	Image resolution		clear and distinct					
63	Image resolution		clear and distinct					

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EQUIPMENT TEST
DATA SHEET 10 **OF** 11

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ 1 - ° ' " 90° 00' 00.0"	Δ 2 - 270° 00' 00.0" ° ' "	Δ 3 - 270° 00' 00.0" ° ' "
	Δ 4 - ° ' " 90° 00' 00.0"	Δ 5 - ° ' " 90° 00' 00.0"	Δ 6 - 270° 00' 00.0" ° ' "
	Δ 7 - 270° 00' 00.0" ° ' "	Δ 8 - ° ' " 90° 00' 00.0"	Δ 9 - ° ' " 90° 00' 00.0"
	Δ 10 - 270° 00' 00.0" ° ' "	Δ 11 - 270° 00' 00.0" ° ' "	Δ 12 - ° ' " 90° 00' 00.0"
	Δ 13 - ° ' " 90° 00' 00.0"	Δ 14 - 270° 00' 00.0" ° ' "	Δ 15 - 270° 00' 00.0" ° ' "
	Δ 16 - ° ' " 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ______		

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FORM [illegible]

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
REV. D

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES
71, 72	Δ1 - 90° 00' 00.0" Δ2 - 270° 00' 00.0" Δ3 - 270° 00' 00.0" Δ4 - 90° 00' 00.0" Δ5 - 90° 00' 00.0" Δ6 - 270° 00' 00.0" Δ7 - 270° 00' 00.0" Δ8 - 90° 00' 00.0" Δ9 - 90° 00' 00.0" Δ10 - 270° 00' 00.0" Δ11 - 270° 00' 00.0" Δ12 - 90° 00' 00.0" Δ13 - 90° 00' 00.0" Δ14 - 270° 00' 00.0" Δ15 - 270° 00' 00.0" Δ16 - 90° 00' 00.0"
73	$\frac{\Sigma\Delta(71, 72)}{\Sigma\Delta(67, 68)}$ = -________ StLOS/LLOS Parallelism Tolerance: -15 minimum, + 15 maximum

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JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV. E PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PG 3 11

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

	Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
Ⓜ	A	7-28-66	30306	2,4,5	2,3,5	EA	WS
Ⓜ	B	9-1-66	30925	5	-	JP	-
Ⓜ	C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
Ⓜ	D	11-10-66	31892	1,3,4,5	-	EA	-
	E	1-19-67	32692	1,2,3,5	1,2,11	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT Insure that JDC 19128 has been performed within the last six months.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Press OPTICS POWER ON pushbutton on Test Control Panel. OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT Shaft Angle Displayed on Row 1

c. Observe SXT TRN LOS Angle Displayed on Row 2

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM G & N SYSTEM | ASSY

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

10. Set the OPTICS MODE switch on the Indicator Control Panel to MAN. Pushing the Optics hand controller to the left, drive the SXT until Row 1 of the DSKY indicates approximately +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates +27000.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the CONTROLLER SPEED switch on the Indicator Control panel to HI and using the Optics hand controller, drive the SXT until Row 2 of the DSKY indicates approximately +45000. Return the CONTROLLER SPEED switch to LO.

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JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV E PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

16. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (1) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (1) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

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JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV E PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK push-button at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw). Enter VERB 16 NOUN 55 and press ENTR push-button on the DSKY.

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JOB OPTICS POSITIONAL ACCURACY TEST | INITIAL TDRR 29882 D.S. PGS. 11

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
(M) A	7-28-66	30306	2,4,5	2,3,5	EA	WS
(M) B	9-1-66	30925	5	-	JP	-
(M) C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
(M) D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT Insure that JDC 19128 has been performed within the last six months.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Press OPTICS POWER ON pushbutton on Test Control Panel. OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT Shaft Angle Displayed on Row 1

c. Observe SXT TRN LOS Angle Displayed on Row 2

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV E PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

10. Set the OPTICS MODE switch on the Indicator Control Panel to MAN. Pushing the Optics hand controller to the left, drive the SXT until Row 1 of the DSKY indicates approximately +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates +27000.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the CONTROLLER SPEED switch on the Indicator Control panel to HI and using the Optics hand controller, drive the SXT until Row 2 of the DSKY indicates approximately +45000. Return the CONTROLLER SPEED switch to LO.

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JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV E PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

16. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

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JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV E PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw). Enter VERB 16 NOUN 55 and press ENTR pushbutton on the DSKY.

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50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics hand controller, drive the SXT until Row 1 of the DSKY indicates approximately +27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds, then set the OPTICS MODE switch to MAN and the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI and using the Optics hand controller, drive the SXT until Row 1 of the DSKY indicates approximately +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 of the DSKY indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics hand controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics hand controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

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ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

71. Repeat step 66.

72. Repeat steps 67, 68, and 69.

73. Complete calculations for SXT StLOS to LLOS parallelism error.

74. Continue normal test sequence at step 9.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. E
INITIAL TDRR 2988?

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS	deg min	▨	______ ______	▨			(c)
8	Convert line (c) to sec using Calibration chart	sec	▨	( ) ______	▨			(d)
	VDW Reading of WSTLOS	deg min	▨	______ ______	▨			(e)
	Convert line (e) to sec using calibration chart	sec	▨	( ) ______	▨			(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	sec	-15	( ) ______	+15			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨	______ ______ ______	▨	▨	▨	(h)
11	VDW Reading of WLLOS	deg min	▨	( ) ______	▨	▨	▨	(g.1)
	Convert line (g.1) to sec using Calibration chart	sec	▨	( ) ______	▨	▨	▨	(g.2)
12	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ______	▨	▨	▨	(i)
	Calculate: Line (i) + line (g.2)	sec	▨	( ) ______	▨	▨	▨	(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec	▨	______ ______	▨	▨	▨	(k)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

DATE 30 JUN 66

SUBSYSTEM G & N SYSTEM | ASSY

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics hand controller, drive the SXT until Row 1 of the DSKY indicates approximately +27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds, then set the OPTICS MODE switch to MAN and the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI and using the Optics hand controller, drive the SXT until Row 1 of the DSKY indicates approximately +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 of the DSKY indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics hand controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics hand controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

SUBSYSTEM G & N SYSTEM | ASSY

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

71. Repeat step 66.

72. Repeat steps 67, 68, and 69.

73. Complete calculations for SXT StLOS to LLOS parallelism error.

74. Continue normal test sequence at step 9.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. E
INITIAL TDRR 29382

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ____________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE ______
NAME ____________ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS	deg min	▨	______ ______	▨			(c)
8	Convert line (c) to sec using Calibration chart	sec	▨	( ) ______	▨			(d)
	VDW Reading of WSTLOS	deg min	▨	______ ______	▨			(e)
	Convert line (e) to sec using calibration chart	sec	▨	( ) ______	▨			(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	sec	-15	( ) ______	+15			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨	______ ______ ______	▨	▨	▨	(h)
11	VDW Reading of WLLOS	deg min	▨	( ) ______	▨	▨	▨	(g.1)
	Convert line (g.1) to sec using Calibration chart	sec	▨	( ) ______	▨	▨	▨	(g.2)
12	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ______	▨	▨	▨	(i)
	Calculate: Line (i) + line (g.2)	sec	▨	( ) ______	▨	▨	▨	(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec	▨	______ ______	▨	▨	▨	(k)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	(l)
		Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	
18	Select bit count 45°	bits	16382		16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( )	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart	deg min	▨		▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	(p)
		Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits	▨		▨	▨	▨	(q)
24	Calculate: Line (m) +00009 bits	bits	▨	( )	▨	▨	▨	(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( )	+2			(s)
	Calculate: Line (j) +30 sec	sec	▨	( )	▨	▨	▨	(t)
	Convert Line (t) to VDW reading using calibration chart	deg min	▨		▨	▨	▨	(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	(v)
		Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits	▨		▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( )	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( )	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( )	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart	deg min	▨		▨	▨	▨	(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	(ab)
		Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	
33	Select bit count 45° (±60")	bits	▨		▨	▨	▨	(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits	▨	( )	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( )	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( )	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart	deg min	▨		▨	▨	▨	(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	(ah)
		Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits		__ __ . __ __ __ ______				(l)
		Row 2 deg bits		__ __ . __ __ __ ______				
		Row 2 deg bits		__ __ . __ __ __ ______				
18	Select bit count 45°	bits	16382	______	16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( ) ______				(n)
	Convert Line (n) to VDW reading using calibration chart	deg min		______ ______				(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		__ __ . __ __ __ ______				(p)
		Row 2 deg bits		__ __ . __ __ __ ______				
		Row 2 deg bits		__ __ . __ __ __ ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ______				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ______	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ______				(t)
	Convert Line (t) to VDW reading using calibration chart	deg min		______ ______				(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits		__ __ . __ __ __ ______				(v)
		Row 2 deg bits		__ __ . __ __ __ ______				
		Row 2 deg bits		__ __ . __ __ __ ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		______				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) ______				(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ______	+2			(y)
	Calculate: Line (j) +60 sec	sec		( ) ______				(z)
	Convert Line (z) to VDW reading using calibration chart	deg min		______ ______				(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		__ __ . __ __ __ ______				(ab)
		Row 2 deg bits		__ __ . __ __ __ ______				
		Row 2 deg bits		__ __ . __ __ __ ______				
33	Select bit count 45° (±60")	bits		______				(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 11

JDC NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) ______				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) ______	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) ______				(af)
	Convert Line (af) to VDW reading using calibration chart	deg min		______ ______				(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		__ __ . __ __ __ ______				(ah)
		Row 2 deg bits		__ __ . __ __ __ ______				
		Row 2 deg bits		__ __ . __ __ __ ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 11

JDC	
NO.	12214
REV.	E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	______	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( )______	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( )______	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( )______	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart	deg min	▨	______ ______	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	___ . ____ ______	▨	▨	▨	(an)
		Row 2 deg bits	▨	___ . ____ ______	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 11

JDC	
NO.	12214
REV.	E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	___ . ____ ______	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	______	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( )______	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( )______	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( )______	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min	▨	______ ______	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	___ . ____ ______	▨	▨	▨	(at)
		Row 2 deg bits	▨	___ . ____ ______	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
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JDC	
NO.	12214
REV.	E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	___ . ____ ______	▨	▨	▨	
48	Select bit count 45° (-60")	bits	▨	______	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( )______	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( )______	+2			(aw)
53	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 **OF** 11

JDC	
NO.	12214
REV.	E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ______		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	________	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ________	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ________	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ________	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	(an)
		Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	________	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( ) ________	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ________	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( ) ________	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	(at)
		Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	
48	Select bit count 45° (-60)')	bits	▨	________	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( ) ________	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ________	+2			(aw)
53	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ 1 - 90° 00' 00.0"	Δ 2 - 270° 00' 00.0" ____° ____' ____"	Δ 3 - 270° 00' 00.0" ____° ____' ____"
	Δ 4 - 90° 00' 00.0"	Δ 5 - 90° 00' 00.0"	Δ 6 - 270° 00' 00.0" ____° ____' ____"
	Δ 7 - 270° 00' 00.0" ____° ____' ____"	Δ 8 - 90° 00' 00.0"	Δ 9 - 90° 00' 00.0"
	Δ 10 - 270° 00' 00.0" ____° ____' ____"	Δ 11 - 270° 00' 00.0" ____° ____' ____"	Δ 12 - 90° 00' 00.0"
	Δ 13 - 90° 00' 00.0"	Δ 14 - 270° 00' 00.0" ____° ____' ____"	Δ 15 - 270° 00' 00.0" ____° ____' ____"
	Δ 16 - 90° 00' 00.0"		
	$\frac{\Sigma \Delta}{16}$ = ________		

DATE 30 JUN 66

FORM 00145

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
71, 72	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00"		
73	ΣΔ(71, 72) = ______ ΣΔ(67, 68) = - ______ StLOS/LLOS Parallelism Tolerance: -15 minimum, + 15 maximum		

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Chg. 7-23-65

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EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
REV. E

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
71, 72	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00"		
73	ΣΔ(71, 72) = ΣΔ(67, 68) = -________ StLOS/LLOS Parallelism Tolerance: -15 minimum, + 15 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 **REV.** F **PAGE** 1 **OF** 6

INITIAL TDRR 29882 **D.S. PGS** 11

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT Insure that JDC 19128 has been performed within the last six months.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Press OPTICS POWER ON pushbutton on Test Control Panel. OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Deleted.

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 **REV** F **PAGE** 2 **OF** 6

SUBSYSTEM G & N SYSTEM

ASSY

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

10. Set the OPTICS MODE switch on the Indicator Control Panel to CMC and perform the following DSKY operations:

VERB 41 NOUN 55 ENTR
+27000 ENTR
+45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the OPTICS MODE and CONTROLLER SPEED switches on the Indicator Control panel to MAN and LO respectively.

JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 **REV** F **PAGE** 3 **OF** 6

SUBSYSTEM G & N SYSTEM

ASSY

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (1) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (1) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

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JOB OPTICS POSITIONAL ACCURACY TEST

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SUBSYSTEM G & N SYSTEM

ASSY

recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

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INITIAL TDRR 29882 D.S. PGS 11

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT Insure that JDC 19128 has been performed within the last six months.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Press OPTICS POWER ON pushbutton on Test Control Panel. OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Deleted.

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

10. Set the OPTICS MODE switch on the Indicator Control Panel to CMC and perform the following DSKY operations:

VERB 41 NOUN 55 ENTR
+27000 ENTR
+45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the OPTICS MODE and CONTROLLER SPEED switches on the Indicator Control panel to MAN and LO respectively.

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16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (1) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (1) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

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recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics Hand Controller, drive the SXT until the Shaft TPAC indicates approximately +27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics Hand Controller to fine position and hold the SXT so the Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds, then set the OPTICS MODE switch to MAN and the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI, and using the Optics Hand Controller, drive the SXT until the Shaft TPAC indicates approximately +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics Hand Controller to fine position and hold the SXT so that the Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

DATE 30 JUN 66

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

71. Repeat step 66.

72. Repeat steps 67, 68, and 69.

73. Complete calculations for SXT StLOS to LLOS parallelism error.

74. Continue normal test sequence at step 9.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. F
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS	deg min		______ ______				(c)
8	Convert line (c) to sec using Calibration chart	sec		( ) ______				(d)
	VDW Reading of WSTLOS	deg min		______ ______				(e)
	Convert line (e) to sec using calibration chart	sec		( ) ______				(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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FCR 1 00146
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B. 19. StLOS-LLOS parallelism	$\widehat{sec}$	-15	( ) ______	+15			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 12223 Item C. 1 to nearest whole second	deg min sec		______ ______ ______				(h)
11	VDW Reading of WLLOS	deg min		( ) ______				(g. 1)
	Convert line (g. 1) to sec using Calibration chart	sec		( ) ______				(g. 2)
12	Calculate: 45° - line (h) to nearest second	sec		( ) ______				(i)
	Calculate: Line (i) + line (g. 2)	sec		( ) ______				(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec		______ ______				(k)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC NO. 12214
REV. ___

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17 —	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits		– – . – – – ________				(l)
		Row 2 deg bits		– – . – – – ________				
		Row 2 deg bits		– – . – – – ________				
18	Select bit count 45°	bits	16382	________	16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( ) ________				(n)
	Convert Line (n) to VDW reading using calibration chart	deg min		________ ________				(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		– – . – – – ________				(p)
		Row 2 deg bits		– – . – – – ________				
		Row 2 deg bits		– – . – – – ________				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ________				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ________	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ________				(t)
	Convert Line (t) to VDW reading using calibration chart	deg min		________ ________				(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits		– – . – – – ________				(v)
		Row 2 deg bits		– – . – – – ________				
		Row 2 deg bits		– – . – – – ________				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		________				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) ________				(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ________	+2			(y)
	Calculate: Line (j) +60 sec	sec		( ) ________				(z)
	Convert Line (z) to VDW reading using calibration chart	deg min		________ ________				(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		– – . – – – ________				(ab)
		Row 2 deg bits		– – . – – – ________				
		Row 2 deg bits		– – . – – – ________				
33	Select bit count 45° (±60")	bits		________				(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 11

JDC NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) ________				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) ________	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) ________				(af)
	Convert Line (af) to VDW reading using calibration chart	deg min		________ ________				(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		– – . – – – ________				(ah)
		Row 2 deg bits		– – . – – – ________				
		Row 2 deg bits		– – . – – – ________				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits		— — . — — — ____				(l)
		Row 2 deg bits		— — . — — — ____				
		Row 2 deg bits		— — . — — — ____				
18	Select bit count 45°	bits	16382	____	16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( ) ____				(n)
	Convert Line (n) to VDW reading using calibration chart	deg min		____ ____				(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		— — . — — — ____				(p)
		Row 2 deg bits		— — . — — — ____				
		Row 2 deg bits		— — . — — — ____				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ____				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ____	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ____				(t)
	Convert Line (t) to VDW reading using calibration chart	deg min		____ ____				(u)
27	Record CMC NAV DSKY Row 2 display *45° (+30")	Row 2 deg bits		— — . — — — ____				(v)
		Row 2 deg bits		— — . — — — ____				
		Row 2 deg bits		— — . — — — ____				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		____				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) ____				(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ____	+2			(y)
	Calculate: Line (j) +60 sec	sec		( ) ____				(z)
	Convert Line (z) to VDW reading using calibration chart	deg min		____ ____				(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		— — . — — — ____				(ab)
		Row 2 deg bits		— — . — — — ____				
		Row 2 deg bits		— — . — — — ____				
33	Select bit count 45° (±60")	bits		____				(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 11

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) ____				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) ____	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) ____				(af)
	Convert Line (af) to VDW reading using calibration chart	deg min		____ ____				(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		— — . — — — ____				(ah)
		Row 2 deg bits		— — . — — — ____				
		Row 2 deg bits		— — . — — — ____				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 11

JDC
NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	____	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ____	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ____	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ____	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart	deg min	▨	____ ____	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	(an)
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 11

JDC
NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	____	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( ) ____	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ____	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( ) ____	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min	▨	____ ____	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	(at)
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 9 OF 11

JDC
NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	
48	Select bit count 45° (-60)')	bits	▨	____	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( ) ____	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ____	+2			(aw)
53	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC
NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0" ____ ° ' "	Δ2 - 270° 00' 00.0" ____ ° ' "	Δ3 - 270° 00' 00.0" ____ ° ' "
	Δ4 - 90° 00' 00.0" ____ ° ' "	Δ5 - 90° 00' 00.0" ____ ° ' "	Δ6 - 270° 00' 00.0" ____ ° ' "
	Δ7 - 270° 00' 00.0" ____ ° ' "	Δ8 - 90° 00' 00.0" ____ ° ' "	Δ9 - 90° 00' 00.0" ____ ° ' "
	Δ10 - 270° 00' 00.0" ____ ° ' "	Δ11 - 270° 00' 00.0" ____ ° ' "	Δ12 - 90° 00' 00.0" ____ ° ' "
	Δ13 - 90° 00' 00.0" ____ ° ' "	Δ14 - 270° 00' 00.0" ____ ° ' "	Δ15 - 270° 00' 00.0" ____ ° ' "
	Δ16 - 90° 00' 00.0" ____ ° ' "		
	$\frac{\Sigma\Delta}{16}$ = ____		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 11

JDC NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits		______				(ai)
39	Calculate: Line (m) -00003 bits	bits		( ) ______				(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ______	+2			(ak)
	Calculate: Line (j) -90 sec	sec		( ) ______				(al)
	Convert Line (al) to VDW reading using calibration chart	deg min		______ ______				(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		— — · — — — ______				(an)
		Row 2 deg bits		— — · — — — ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 11

JDC NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits		— — · — — — ______				
43	Select bit count 45° (-90")	bits		______				(ao)
44	Calculate: Line (m) -00009 bits	bits		( ) ______				(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ______	+2			(aq)
	Calculate: Line (j) -60 sec	sec		( ) ______				(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min		______ ______				(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		— — · — — — ______				(at)
		Row 2 deg bits		— — · — — — ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 **OF** 11

JDC NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits		— — · — — — ______				
48	Select bit count 45° (-60)')	bits		______				(au)
49	Calculate: Line (m) -00006 bits	bits		( ) ______				(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ______	+2			(aw)
53	SCT (Offset 25°)			Reacted as Specified				
54	SCT Comparision (Offset 0°)			Reacted as Specified				
60	Image resolution		clear and distinct					
63	Image resolution		clear and distinct					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 **OF** 11

JDC NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ______		

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FORM 00145

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
REV. I

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES
71, 72	Δ1 - 90° 00' 00.0" Δ2 - 270° 00' 00.0" Δ3 - 270° 00' 00.0" Δ4 - 90° 00' 00.0" Δ5 - 90° 00' 00.0" Δ6 - 270° 00' 00.0" Δ7 - 270° 00' 00.0" Δ8 - 90° 00' 00.0" Δ9 - 90° 00' 00.0" Δ10 - 270° 00' 00.0" Δ11 - 270° 00' 00.0" Δ12 - 90° 00' 00.0" Δ13 - 90° 00' 00.0", Δ14 - 270° 00' 00.0" Δ15 - 270° 00' 00.0" Δ16 - 90° 00' 00"
73	$\frac{\Sigma\Delta(71,\ 72)}{\Sigma\Delta(67,\ 68)}$ = -______ StLOS/LLOS Parallelism Tolerance: -15 minimum, + 15 maximum

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FORM 4-148
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
REV. F

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES
71, 72	Δ1 - 90° 00' 00.0" Δ2 - 270° 00' 00.0" Δ3 - 270° 00' 00.0" Δ4 - 90° 00' 00.0" Δ5 - 90° 00' 00.0" Δ6 - 270° 00' 00.0" Δ7 - 270° 00' 00.0" Δ8 - 90° 00' 00.0" Δ9 - 90° 00' 00.0" Δ10 - 270° 00' 00.0" Δ11 - 270° 00' 00.0" Δ12 - 90° 00' 00.0" Δ13 - 90° 00' 00.0", Δ14 - 270° 00' 00.0" Δ15 - 270° 00' 00.0" Δ16 - 90° 00' 00"
73	$\frac{\Sigma\Delta(71,\ 72)}{\Sigma\Delta(67,\ 68)}$ = - ________ StLOS/LLOS Parallelism Tolerance: -15 minimum, + 15 maximum

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 REV. G PAGE 1 OF 6

INITIAL TDRR 29882 DS PGS 11

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT Insure that JDC 19128 has been performed within the last six months.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Press OPTICS POWER ON pushbutton on Test Control Panel. OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Deleted.

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record the DSKY Row 1 (Shaft Ang e) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 REV G PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

10. Set the OPTICS MODE switch on the Indicator Control Panel to CMC and perform the following DSKY operations:

VERB 41 NOUN 55 ENTR
+27000 ENTR
+45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the OPTICS MODE and CONTROLLER SPEED switches on the Indicator Control panel to MAN and LO respectively.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 REV G PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (v).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 REV G PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

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JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV G PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics Hand Controller, drive the SXT until the Shaft TPAC indicates approximately +27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics Hand Controller to fine position and hold the SXT so the Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds, then set the OPTICS MODE switch to MAN and the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI, and using the Optics Hand Controller, drive the SXT until the Shaft TPAC indicates approximately +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics Hand Controller to fine position and hold the SXT so that the Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

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JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV G PAGE 6 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

71. Repeat step 66.

72. Repeat steps 67, 68, and 69.

73. Complete calculations for SXT StLOS to LLOS parallelism error.

74. Continue normal test sequence at step 9.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. G
INITIAL TDRR 29382

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ ______ CAL DATE

NAME ____________ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS	deg min	▨	______ ______	▨			(c)
8	Convert line (c) to sec using Calibration chart	sec	▨	( ) ______	▨			(d)
	VDW Reading of WSTLOS	deg min	▨	______ ______	▨			(e)
	Convert line (e) to sec using calibration chart	sec	▨	( ) ______	▨			(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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FORM 00146
Orig 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV. G

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	$\widehat{\text{sec}}$	-10	( ) ______	+10			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨	______ ______ ______	▨	▨	▨	(h)
11	VDW Reading of WLLOS	deg min	▨	( ) ______	▨	▨	▨	(g.1)
	Convert line (g.1) to sec using Calibration chart	sec	▨	( ) ______	▨	▨	▨	(g.2)
12	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ______	▨	▨	▨	(i)
	Calculate: Line (i) + line (g.2)	sec	▨	( ) ______	▨	▨	▨	(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec	▨	______ ______	▨	▨	▨	(k)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV G

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	(l)
		Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	
18	Select bit count 45°	bits	16382	________	16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( )________	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	(p)
		Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV G

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits	▨		▨	▨	▨	(q)
24	Calculate: Line (m) +00009 bits	bits	▨	( )________	▨	▨	▨	(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( )________	+2			(s)
	Calculate: Line (j) +30 sec	sec	▨	( )________	▨	▨	▨	(t)
	Convert Line (t) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	(v)
		Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE 30 JUN 66

FORM 0147
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV G

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits	▨	________	▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( )________	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( )________	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( )________	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	(ab)
		Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	
33	Select bit count 45° (±60")	bits	▨	________	▨	▨	▨	(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE 30 JUN 66

FORM 0147
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 11

JDC
NO. 12214
REV G

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits	▨	( )________	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( )________	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( )________	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	(ah)
		Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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FORM 0147
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 11

JDC
NO. 12214
REV. G

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	________	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( )________	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( )________	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( )________	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	___.___ ________	▨	▨	▨	(an)
		Row 2 deg bits	▨	___.___ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 11

JDC
NO. 12214
REV. G

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	___.___ ________	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	________	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( )________	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( )________	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( )________	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	___.___ ________	▨	▨	▨	(at)
		Row 2 deg bits	▨	___.___ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 11

JDC
NO. 12214
REV. G

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	___.___ ________	▨	▨	▨	
48	Select bit count 45° (-60")	bits	▨	________	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( )________	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( )________	+2			(aw)
53	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC
NO. 12214
REV. G

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES
67, 68	Δ1 - 90° 00' 00.0" ___° ___' ___" Δ2 - 270° 00' 00.0" ___° ___' ___" Δ3 - 270° 00' 00.0" ___° ___' ___" Δ4 - 90° 00' 00.0" ___° ___' ___" Δ5 - 90° 00' 00.0" ___° ___' ___" Δ6 - 270° 00' 00.0" ___° ___' ___" Δ7 - 270° 00' 00.0" ___° ___' ___" Δ8 - 90° 00' 00.0" ___° ___' ___" Δ9 - 90° 00' 00.0" ___° ___' ___" Δ10 - 270° 00' 00.0" ___° ___' ___" Δ11 - 270° 00' 00.0" ___° ___' ___" Δ12 - 90° 00' 00.0" ___° ___' ___" Δ13 - 90° 00' 00.0" ___° ___' ___" Δ14 - 270° 00' 00.0" ___° ___' ___" Δ15 - 270° 00' 00.0" ___° ___' ___" Δ16 - 90° 00' 00.0" ___° ___' ___" $\frac{\Sigma\Delta}{16}$ = ________

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 1221
REV. C

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES
71, 72	Δ1 - 90° 00' 00.0" Δ2 - 270° 00' 00.0" Δ3 - 270° 00' 00.0" Δ4 - 90° 00' 00.0" Δ5 - 90° 00' 00.0" Δ6 - 270° 00' 00.0" Δ7 - 270° 00' 00.0" Δ8 - 90° 00' 00.0" Δ9 - 90° 00' 00.0" Δ10 - 270° 00' 00.0" Δ11 - 270° 00' 00.0" Δ12 - 90° 00' 00.0" Δ13 - 90° 00' 00.0" Δ14 - 270° 00' 00.0" Δ15 - 270° 00' 00.0" Δ16 - 90° 00' 00"
73	$\frac{\Sigma\Delta(71, 72) =}{\Sigma\Delta(67, 68) =}$ -________ StLOS/LLOS Parallelism Tolerance: -15 minimum, + 15 maximum

DATE 30 JUN 66

JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 REV. H PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 11

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT Insure that JDC 19128 has been performed within the last six months.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Press OPTICS POWER ON pushbutton on Test Control Panel. OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Deleted.

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

10. Set the OPTICS MODE switch on the Indicator Control Panel to CMC and perform the following DSKY operations:

VERB 41 NOUN 55 ENTR
+27000 ENTR
+45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the OPTICS MODE and CONTROLLER SPEED switches on the Indicator Control panel to MAN and LO respectively.

---

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

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recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics Hand Controller, drive the SXT until the Shaft TPAC indicates approximately +27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics Hand Controller to fine position and hold the SXT so the Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds, then set the OPTICS MODE switch to MAN and the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI, and using the Optics Hand Controller, drive the SXT until the Shaft TPAC indicates approximately +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics Hand Controller to fine position and hold the SXT so that the Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

71. Repeat step 66.

72. Repeat steps 67, 68, and 69.

73. Complete calculations for SXT StLOS to LLOS parallelism error.

74. Continue normal test sequence at step 9.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. H
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS	deg min		______ ______				(c)
8	Convert line (c) to sec using Calibration chart	sec		( ) ______				(d)
	VDW Reading of WSTLOS	deg min		______ ______				(e)
	Convert line (e) to sec using calibration chart	sec		( ) ______				(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV H

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B. 19. StLOS-LLOS parallelism	sec*	-10	( ) ______	+10			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 12223 Item C. 1 to nearest whole second	deg min sec		______ ______ ______				(h)
11	VDW Reading of WLLOS	deg min		( ) ______				(g. 1)
	Convert line (g. 1) to sec using Calibration chart	sec		( ) ______				(g. 2)
12	Calculate: 45° - line (h) to nearest second	sec		( ) ______				(i)
	Calculate: Line (i) + line (g. 2)	sec		( ) ______				(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec		______ ______				(k)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV. H

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(l)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
18	Select bit count 45°	bits	16382	______	16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( ) ______	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart	deg min	▨	______ ______	▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(p)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. H

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits	▨		▨	▨	▨	(q)
24	Calculate: Line (m) +00009 bits	bits	▨	( ) ______	▨	▨	▨	(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ______	+2			(s)
	Calculate: Line (j) +30 sec	sec	▨	( ) ______	▨	▨	▨	(t)
	Convert Line (t) to VDW reading using calibration chart	deg min	▨	______ ______	▨	▨	▨	(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(v)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV. H

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits	▨	______	▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( ) ______	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ______	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( ) ______	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart	deg min	▨	______ ______	▨	▨	▨	(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(ab)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
33	Select bit count 45° (±60")	bits	▨	______	▨	▨	▨	(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 11

JDC
NO. 12214
REV. H

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits	▨	( ) ______	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) ______	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( ) ______	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart	deg min	▨	______ ______	▨	▨	▨	(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(ah)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 11

JDC
NO. 12214
REV. H

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	________	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ________	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ________	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ________	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	(an)
		Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 8 OF 11

JDC
NO. 12214
REV. H

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	________	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( ) ________	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ________	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( ) ________	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	(at)
		Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 9 OF 11

JDC
NO. 12214
REV. H

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	
48	Select bit count 45° (-60")	bits	▨	________	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( ) ________	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ________	+2			(aw)
53	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ________		

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EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
REV. H

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
71, 72	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00"		
73	$\frac{\Sigma\Delta(71, 72) =}{\Sigma\Delta(67, 68) =}$ - ________ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 REV. J PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 11

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	

REFERENCES PS 2015000
JDC 19128

IMPORTANT Insure that JDC 19128 has been performed within the last six months.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Press OPTICS POWER ON pushbutton on Test Control Panel. OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control Panel to MAN.

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, perform the following DSKY operations:

VERB 06 NOUN 55 ENTR

Record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

10. Set the OPTICS MODE switch on the Indicator Control Panel to CMC and perform the following DSKY operations:

VERB 41 NOUN 55 ENTR
+27000 ENTR
+45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the OPTICS MODE and CONTROLLER SPEED switches on the Indicator Control panel to MAN and LO respectively.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

SUBSYSTEM G & N SYSTEM ASSY

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics Hand Controller, drive the SXT until the Shaft TPAC indicates approximately +27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics Hand Controller to fine position and hold the SXT so the Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds, then set the OPTICS MODE switch to MAN and the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI, and using the Optics Hand Controller, drive the SXT until the Shaft TPAC indicates approximately +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics Hand Controller to fine position and hold the SXT so that the Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

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SUBSYSTEM G & N SYSTEM ASSY

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

71. Repeat step 66.

72. Repeat steps 67, 68, and 69.

73. Complete calculations for SXT StLOS to LLOS parallelism error.

74. Continue normal test sequence at step 9.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. J
INITIAL TDRR 29832

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______

NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS	deg min		______ ______				(c)
8	Convert line (c) to sec using Calibration chart	sec		( ) ______				(d)
	VDW Reading of WSTLOS	deg min		______ ______				(e)
	Convert line (e) to sec using calibration chart	sec		( ) ______				(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV J

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	$\widehat{\text{sec}}$	-10	( ) ______	+10			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 12223 Item C.1 to nearest whole second	deg min sec		______ ______ ______				(h)
11	VDW Reading of WLLOS	deg min		( ) ______				(g.1)
	Convert line (g.1) to sec using Calibration chart	sec		( ) ______				(g.2)
12	Calculate: 45° - line (h) to nearest second	sec		( ) ______				(i)
	Calculate: Line (i) + line (g.2)	sec		( ) ______				(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec		______ ______				(k)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV. J

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	(l)
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
18	Select bit count 45°	bits	16382	________	16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( )________	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	(p)
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. J

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits	▨		▨	▨	▨	(q)
24	Calculate: Line (m) +00009 bits	bits	▨	( )________	▨	▨	▨	(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( )________	+2			(s)
	Calculate: Line (j) +30 sec	sec	▨	( )________	▨	▨	▨	(t)
	Convert Line (t) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	(v)
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV. J

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits	▨	________	▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( )________	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( )________	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( )________	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	(ab)
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
33	Select bit count 45° (±60")	bits	▨	________	▨	▨	▨	(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 11

JDC
NO. 12214
REV. J

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits	▨	( )________	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( )________	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( )________	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	(ah)
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 11

JDC
NO. 12214
REV. J

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	____	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ____	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ____	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ____	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart	deg min	▨	____ ____	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	— — · — — — ____	▨	▨	▨	(an)
		Row 2 deg bits	▨	— — · — — — ____	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 11

JDC
NO. 12214
REV. J

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	— — · — — — ____	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	____	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( ) ____	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ____	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( ) ____	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min	▨	____ ____	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	— — · — — — ____	▨	▨	▨	(at)
		Row 2 deg bits	▨	— — · — — — ____	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 11

JDC
NO. 12214
REV. J

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	— — · — — — ____	▨	▨	▨	
48	Select bit count 45° (-60)')	bits	▨	____	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( ) ____	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ____	+2			(aw)
53	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC
NO. 12214
REV. J

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ____		

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FORM 00145

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12:14
REV. J

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
71, 72	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00"		
73	$\frac{\Sigma\Delta(71, 72)}{\Sigma\Delta(67, 68)}$ = -________ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 REV. K PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 11

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT 1. Insure that JDC 19128 has been performed within the last six months. (Cont. below)

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Press OPTICS POWER ON pushbutton on Test Control Panel. OPTICS POWER ON pushbutton shall light. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control Panel to MAN.

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, perform the following DSKY operations:

VERB 06 NOUN 56 ENTR

Record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FCR 1 0 [illegible]
Chg. 3-[illegible]

SUBSYSTEM G & N SYSTEM ASSY

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

10. Set the OPTICS MODE switch on the Indicator Control Panel to CMC and perform the following DSKY operations:

VERB 41 NOUN 55 ENTR
+27000 ENTR
+45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the OPTICS MODE and CONTROLLER SPEED switches on the Indicator Control panel to MAN and LO respectively.

SUBSYSTEM G & N SYSTEM ASSY

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

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SUBSYSTEM G & N SYSTEM ASSY

recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics Hand Controller, drive the SXT until the Shaft TPAC indicates approximately +27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics Hand Controller to fine position and hold the SXT so the Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 20 seconds, then set the OPTICS MODE switch to MAN and the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN.

57. Set the CONTROLLER SPEED switch to HI, and using the Optics Hand Controller, drive the SXT until the Shaft TPAC indicates approximately +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics Hand Controller to fine position and hold the SXT so that the Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO. Wait 20 seconds then set the OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

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ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

71. Repeat step 66.

72. Repeat steps 67, 68, and 69.

73. Complete calculations for SXT StLOS to LLOS parallelism error.

74. Continue normal test sequence at step 9.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. K
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS	deg min	▨	______ ______	▨			(c)
8	Convert line (c) to sec using Calibration chart	sec	▨	( ) ______	▨			(d)
	VDW Reading of WSTLOS	deg min	▨	______ ______	▨			(e)
	Convert line (e) to sec using calibration chart	sec	▨	( ) ______	▨			(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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FORM 0-146
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV K

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	sec	-10	( ) ______	+10			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨	______ ______ ______	▨	▨	▨	(h)
11	VDW Reading of WLLOS	deg min	▨	( ) ______	▨	▨	▨	(g.1)
	Convert line (g.1) to sec using Calibration chart	sec	▨	( ) ______	▨	▨	▨	(g.2)
12	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ______	▨	▨	▨	(i)
	Calculate: Line (i) + line (g.2)	sec	▨	( ) ______	▨	▨	▨	(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec	▨	______ ______	▨	▨	▨	(k)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV. K

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits		— — . — — — ________				(l)
		Row 2 deg bits		— — . — — — ________				
		Row 2 deg bits		— — . — — — ________				
18	Select bit count 45°	bits	16382	________	16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( ) ________				(n)
	Convert Line (n) to VDW reading using calibration chart	deg min		________ ________				(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		— — . — — — ________				(p)
		Row 2 deg bits		— — . — — — ________				
		Row 2 deg bits		— — . — — — ________				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. K

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ________				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ________	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ________				(t)
	Convert Line (t) to VDW reading using calibration chart	deg min		________ ________				(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits		— — . — — — ________				(v)
		Row 2 deg bits		— — . — — — ________				
		Row 2 deg bits		— — . — — — ________				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV. K

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		________				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) ________				(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ________	+2			(y)
	Calculate: Line (j) +60 sec	sec		( ) ________				(z)
	Convert Line (z) to VDW reading using calibration chart	deg min		________ ________				(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		— — . — — — ________				(ab)
		Row 2 deg bits		— — . — — — ________				
		Row 2 deg bits		— — . — — — ________				
33	Select bit count 45° (±60")	bits		________				(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
REV. K

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) ________				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) ________	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) ________				(af)
	Convert Line (af) to VDW reading using calibration chart	deg min		________ ________				(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		— — . — — — ________				(ah)
		Row 2 deg bits		— — . — — — ________				
		Row 2 deg bits		— — . — — — ________				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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DATA SHEET 7 OF 11

JDC
NO. 12214
REV. K

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	________	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ________	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ________	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ________	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	___ . ______ ________	▨	▨	▨	(an)
		Row 2 deg bits	▨	___ . ______ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	___ . ______ ________	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	________	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( ) ________	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ________	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( ) ________	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	___ . ______ ________	▨	▨	▨	(at)
		Row 2 deg bits	▨	___ . ______ ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	___ . ______ ________	▨	▨	▨	
48	Select bit count 45° (-60)")	bits	▨	________	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( ) ________	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ________	+2			(aw)
53	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0" ____° ____' ____"	Δ3 - 270° 00' 00.0" ____° ____' ____"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0" ____° ____' ____"
	Δ7 - 270° 00' 00.0" ____° ____' ____"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0" ____° ____' ____"	Δ11 - 270° 00' 00.0" ____° ____' ____"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0" ____° ____' ____"	Δ15 - 270° 00' 00.0" ____° ____' ____"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma \Delta}{16}$ = ________		

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EQUIPMENT TEST
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JDC
NO. 12214
REV K

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
71, 72	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00"		
73	$\frac{\Sigma\Delta(71, 72) =}{\Sigma\Delta(67, 68) =}$ - ________ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 REV. L PAGE 1 OF 9
INITIAL TDRR 29882 D.S. PGS. 11

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-
L	9-28-67	34741	1,2,3,6,7,8	1,9	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 1. Insure that JDC 19128 has been performed within the last six months.

2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

NOTE: 1. The G & N Mounting Fixture shall be set at the 0.0° position.

2. Step 1 applies to Indicator Control panel 2021290 only. Step 1A applies to all Indicator Control panels except 2021290.

1. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS ZERO switch is set to OFF.

1A. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and that OPTICS TRACKER switch is set to OFF.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB OPTICS POSITIONAL ACCURACY TEST
JDC 12214 REV L PAGE 2 OF 9
SUBSYSTEM G & N SYSTEM
ASSY

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Set OPTICS COUPLING switch to DIRECT and set OPTICS SPEED switch to HI.

2A. Set OPTICS CONTROLLER COUPLING switch to DIRECT and set OPTICS CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control Panel to MAN.

NOTE: Step 4 applies to Indicator Control panel 2021290 only. Step 4A applies to all Indicator Control panels except 2021290.

4. Set OPTICS ZERO switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR

b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

4A. Set OPTICS MODE switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR

b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

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JOB OPTICS POSITIONAL ACCURACY TEST
JDC 12214 REV L PAGE 3 OF 9
SUBSYSTEM G & N SYSTEM
ASSY

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

NOTE: Step 10 applies to Indicator Control panel 2021290 only. Step 10A applies to all Indicator Control panels except 2021290.

10. Set OPTICS ZERO switch on Indicator Control panel to ZERO. Set OPTICS MODE switch to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR

b. +27000 ENTR

c. +45000 ENTR

Wait until optics stop driving before proceeding.

10A. Set OPTICS MODE switch on Indicator Control panel to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR

b. +27000 ENTR

c. +45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to LO.

15A. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS CONTROLLER SPEED switch to LO.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

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SUBSYSTEM G & N SYSTEM
ASSY

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

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recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

NOTE: Step 50 applies to Indicator Control panel 2021290 only. Step 50A applies to all Indicator Control panels except 2021290.

50. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

50A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 51 applies to Indicator Control panel 2021290 only. Step 51A applies to all Indicator Control panels except 2021290.

51. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

51A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

NOTE: Step 53 applies to Indicator Control panel 2021290 only. Step 53A applies to all Indicator Control panels except 2021290.

53. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS TEL TRUN switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

53A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

NOTE: Step 54 applies to Indicator Control panel 2021290 only. Step 54A applies to all Indicator Control panels except 2021290.

54. Set OPTICS TEL TRUN switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

54A. Set OPTICS TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

NOTE: Step 55 applies to Indicator Control panel 2021290 only. Step 55A applies to all Indicator Control panels except 2021290.

55. Set OPTICS TEL TRUN switch to SLAVE TO SXT.

55A. Set OPTICS TELESCOPE TRUNNION switch to SLAVE TO SXT.

NOTE: Step 56 applies to Indicator Control panel 2021290. Step 56A applies to all Indicator Control panels except 2021290.

56. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

56A. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 57 applies to Indicator Control panel 2021290 only. Step 57A applies to all Indicator Control panels except 2021290.

57. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

57A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

---

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

NOTE: Step 64 applies to Indicator Control panel 2021290 only. Step 64A applies to all Indicator Control panels except 2021290.

64. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

64A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV L PAGE 9 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

71. Repeat step 66.
72. Repeat steps 67, 68, and 69.
73. Complete calculations for SXT StLOS to LLOS parallelism error.
74. Continue normal test sequence at step 9.

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EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. L
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION
APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4 or 4A	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ____	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ____	+00002			(b)
7	VDW Reading of WLLOS	deg min	▨	____ ____	▨			(c)
8	Convert line (c) to sec using Calibration chart	sec	▨	( ) ____	▨			(d)
	VDW Reading of WSTLOS	deg min	▨	____ ____	▨			(e)
	Convert line (e) to sec using calibration chart	sec	▨	( ) ____	▨			(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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FORM [illegible]
Chg. 7-[illegible]-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV. L

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	$\widehat{\text{sec}}$	-10	( ) ____	+10			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨	____ ____ ____	▨	▨	▨	(h)
11	VDW Reading of WLLOS	deg min	▨	( ) ____	▨	▨	▨	(g.1)
	Convert line (g.1) to sec using Calibration chart	sec	▨	( ) ____	▨	▨	▨	(g.2)
12	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ____	▨	▨	▨	(i)
	Calculate: Line (i) + line (g.2)	sec	▨	( ) ____	▨	▨	▨	(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec	▨	____ ____	▨	▨	▨	(k)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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DATA SHEET 3 OF 11

JDC
NO. 12214
REV. L

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	_ _ . _ _ _ ____	▨	▨	▨	(l)
		Row 2 deg bits	▨	_ _ . _ _ _ ____	▨	▨	▨	
		Row 2 deg bits	▨	_ _ . _ _ _ ____	▨	▨	▨	
18	Select bit count 45°	bits	16382	____	16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( ) ____	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart	deg min	▨	____ ____	▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits	▨	_ _ . _ _ _ ____	▨	▨	▨	(p)
		Row 2 deg bits	▨	_ _ . _ _ _ ____	▨	▨	▨	
		Row 2 deg bits	▨	_ _ . _ _ _ ____	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12214
REV. L

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits	▨		▨	▨	▨	(q)
24	Calculate: Line (m) +00009 bits	bits	▨	( ) ____	▨	▨	▨	(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ____	+2			(s)
	Calculate: Line (j) +30 sec	sec	▨	( ) ____	▨	▨	▨	(t)
	Convert Line (t) to VDW reading using calibration chart	deg min	▨	____ ____	▨	▨	▨	(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	(v)
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits	▨	____	▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( ) ____	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ____	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( ) ____	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart	deg min	▨	____ ____	▨	▨	▨	(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	(ab)
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	
33	Select bit count 45° (±60")	bits	▨	____	▨	▨	▨	(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits	▨	( ) ____	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) ____	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( ) ____	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart	deg min	▨	____ ____	▨	▨	▨	(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	(ah)
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
REV. L

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	____	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ____	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ____	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ____	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart	deg min	▨	____ ____	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	(an)
		Row 2 deg bits	▨	— — . — — — ____	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	______	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( )______	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( )______	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( )______	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min	▨	______ ______	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	(at)
		Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
REV. L

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	
48	Select bit count 45° (-60)')	bits	▨	______	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( )______	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( )______	+2			(aw)
53 or 53A	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54 or 54A	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ______		

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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
71, 72	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00"		
73	ΣΔ(71, 72) = ΣΔ(67, 68) = -______ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST

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INITIAL TDRR 29882 **D.S. PGS** 11

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-
L	9-28-67	34741	1,2,3,6,7,8	1,9	EA	-
M	10-26-67	34934	3	7	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 1. Insure that JDC 19128 has been performed within the last six months.

2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

NOTE: 1. The G & N Mounting Fixture shall be set at the 0.0° position.

2. Step 1 applies to Indicator Control panel 2021290 only. Step 1A applies to all Indicator Control panels except 2021290.

1. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS ZERO switch is set to OFF.

1A. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and that OPTICS TRACKER switch is set to OFF.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 **REV** M **PAGE** 2 **OF** 9

SUBSYSTEM G & N SYSTEM
ASSY

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Set OPTICS COUPLING switch to DIRECT and set OPTICS SPEED switch to HI.

2A. Set OPTICS CONTROLLER COUPLING switch to DIRECT and set OPTICS CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control Panel to MAN.

NOTE: Step 4 applies to Indicator Control panel 2021290 only. Step 4A applies to all Indicator Control panels except 2021290.

4. Set OPTICS ZERO switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR

b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

4A. Set OPTICS MODE switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR

b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

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JOB OPTICS POSITIONAL ACCURACY TEST

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SUBSYSTEM G & N SYSTEM
ASSY

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

NOTE: Step 10 applies to Indicator Control panel 2021290 only. Step 10A applies to all Indicator Control panels except 2021290.

10. Set OPTICS ZERO switch on Indicator Control panel to OFF. Set OPTICS MODE switch to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

10A. Set OPTICS MODE switch on Indicator Control panel to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Uncover the SXT StLOS.

12. Complete lines (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to LO.

15A. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS CONTROLLER SPEED switch to LO.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

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JOB OPTICS POSITIONAL ACCURACY TEST

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SUBSYSTEM G & N SYSTEM
ASSY

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

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recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

NOTE: Step 50 applies to Indicator Control panel 2021290 only. Step 50A applies to all Indicator Control panels except 2021290.

50. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

50A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 51 applies to Indicator Control panel 2021290 only. Step 51A applies to all Indicator Control panels except 2021290.

51. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

51A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

NOTE: Step 53 applies to Indicator Control panel 2021290 only. Step 53A applies to all Indicator Control panels except 2021290.

53. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS TEL TRUN switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

53A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

NOTE: Step 54 applies to Indicator Control panel 2021290 only. Step 54A applies to all Indicator Control panels except 2021290.

54. Set OPTICS TEL TRUN switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

54A. Set OPTICS TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

NOTE: Step 55 applies to Indicator Control panel 2021290 only. Step 55A applies to all Indicator Control panels except 2021290.

55. Set OPTICS TEL TRUN switch to SLAVE TO SXT.

55A. Set OPTICS TELESCOPE TRUNNION switch to SLAVE TO SXT.

NOTE: Step 56 applies to Indicator Control panel 2021290. Step 56A applies to all Indicator Control panels except 2021290.

56. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

56A. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 57 applies to Indicator Control panel 2021290 only. Step 57A applies to all Indicator Control panels except 2021290.

57. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

57A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

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60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

NOTE: Step 64 applies to Indicator Control panel 2021290 only. Step 64A applies to all Indicator Control panels except 2021290.

64. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

64A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV M PAGE 9 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

71. Repeat step 66.
72. Repeat steps 67, 68, and 69.
73. Complete calculations for SXT StLOS to LLOS parallelism error.
74. Continue normal test sequence at step 9.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. M
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4 or 4A	DSKY Row 2 display (Trunnion angle)	deg	-00007	( )	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( )	+00002			(b)
7	VDW Reading of WLLOS	deg min	▨		▨			(c)
8	Convert line (c) to sec using Calibration chart	sec	▨	( )	▨			(d)
	VDW Reading of WSTLOS	deg min	▨		▨			(e)
	Convert line (e) to sec using calibration chart	sec	▨	( )	▨			(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	sec	-10	( )	+10			(g)
Imp	Transfer target calibration angle #3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨		▨	▨	▨	(h)
11	VDW Reading of WLLOS	deg min	▨	( )	▨	▨	▨	(g.1)
	Convert line (g.1) to sec using Calibration chart	sec	▨	( )	▨	▨	▨	(g.2)
12	Calculate: 45° - line (h) to nearest second	sec	▨	( )	▨	▨	▨	(i)
	Calculate: Line (i) + line (g.2)	sec	▨	( )	▨	▨	▨	(j)
	Convert line (j) to VDW reading using calibration chart **	deg sec	▨		▨	▨	▨	(k)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 3 OF 11

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	– –.– – –	▨	▨	▨	(l)
		Row 2 deg bits	▨	– –.– – –	▨	▨	▨	
		Row 2 deg bits	▨	– –.– – –	▨	▨	▨	
18	Select bit count 45°	bits	16382		16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( )	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart	deg min	▨		▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits	▨	– –.– – –	▨	▨	▨	(p)
		Row 2 deg bits	▨	– –.– – –	▨	▨	▨	
		Row 2 deg bits	▨	– –.– – –	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 4 **OF** 11

JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ______				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ______	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ______				(t)
	Convert Line (t) to VDW reading using calibration chart	deg min		______ ______				(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits		— — . — — — ______				(v)
		Row 2 deg bits		— — . — — — ______				
		Row 2 deg bits		— — . — — — ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		______				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) ______				(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ______	+2			(y)
	Calculate: Line (j) +60 sec	sec		( ) ______				(z)
	Convert Line (z) to VDW reading using calibration chart	deg min		______ ______				(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		— — . — — — ______				(ab)
		Row 2 deg bits		— — . — — — ______				
		Row 2 deg bits		— — . — — — ______				
33	Select bit count 45° (±60")	bits		______				(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
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JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) ______				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) ______	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) ______				(af)
	Convert Line (af) to VDW reading using calibration chart	deg min		______ ______				(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		— — . — — — ______				(ah)
		Row 2 deg bits		— — . — — — ______				
		Row 2 deg bits		— — . — — — ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits		______				(ai)
39	Calculate: Line (m) -00003 bits	bits		( ) ______				(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ______	+2			(ak)
	Calculate: Line (j) -90 sec	sec		( ) ______				(al)
	Convert Line (al) to VDW reading using calibration chart	deg min		______ ______				(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-90")	Row 2 deg bits		— — . — — — ______				(an)
		Row 2 deg bits		— — . — — — ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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EQUIPMENT TEST
DATA SHEET 8 OF 11

JDC
NO. 12214
REV. M

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits		— — . — — — ______				
43	Select bit count 45° (-90")	bits		______				(ao)
44	Calculate: Line (m) -00009 bits	bits		( )______				(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( )______	+2			(aq)
	Calculate: Line (j) -60 sec	sec		( )______				(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min		______ ______				(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		— — . — — — ______				(at)
		Row 2 deg bits		— — . — — — ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits		— — . — — — ______				
48	Select bit count 45° (-60")	bits		______				(au)
49	Calculate: Line (m) -00006 bits	bits		( )______				(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( )______	+2			(aw)
53 or 53A	SCT (Offset 25°)			Reacted as Specified				
54 or 54A	SCT Comparision (Offset 0°)			Reacted as Specified				
60	Image resolution		clear and distinct					
63	Image resolution		clear and distinct					

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EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC
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JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0" __°__'__"	Δ3 - 270° 00' 00.0" __°__'__"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0" __°__'__"
	Δ7 - 270° 00' 00.0" __°__'__"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0" __°__'__"	Δ11 - 270° 00' 00.0" __°__'__"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0" __°__'__"	Δ15 - 270° 00' 00.0" __°__'__"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ______		

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DATA SHEET 11 OF 11

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
71, 72	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0" __°__'__"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0" __°__'__"
	Δ7 - 270° 00' 00.0" __°__'__"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0" __°__'__"	Δ11 - 270° 00' 00.0" __°__'__"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0" __°__'__"	Δ15 - 270° 00' 00.0" __°__'__"
	Δ16 - 90° 00' 00"		
73	ΣΔ(71, 72) = ΣΔ(67, 68) = -______ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST

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INITIAL TDRR 29882 D.S. PGS 11

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION SXT LOS parallelism and SXT St LOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-
L	9-28-67	34741	1,2,3,6,7,8	1,9	EA	-
M	10-26-67	34934	3	7	EA	-
N	3-19-68	35891	1,3	1-8,11	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 1. Insure that JDC 19128 has been performed within the last six months.

2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

3. If a Fresh Start (VERB 36 ENTR) is performed at any time during performance of this JDC, set OPTICS ZERO switch (Indicator Control panel 2021290) to OFF and then to ON and wait 18 seconds before proceeding; or set OPTICS MODE switch (all Indicator Control panels except 2021290) to MAN and then to ZERO and wait 18 seconds before proceeding.

NOTE: 1. The G & N Mounting Fixture shall be set at the 0.0° position.

2. Step 1 applies to Indicator Control panel 2021290 only. Step 1A applies to all Indicator Control panels except 2021290.

1. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS ZERO switch is set to OFF.

1A. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and that OPTICS TRACKER switch is set to OFF.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Set OPTICS COUPLING switch to DIRECT and set OPTICS SPEED switch to HI.

2A. Set OPTICS CONTROLLER COUPLING switch to DIRECT and set OPTICS CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control Panel to MAN.

NOTE: Step 4 applies to Indicator Control panel 2021290 only. Step 4A applies to all Indicator Control panels except 2021290.

4. Set OPTICS ZERO switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

4A. Set OPTICS MODE switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

---

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

NOTE: Step 10 applies to Indicator Control panel 2021290 only. Step 10A applies to all Indicator Control panels except 2021290.

10. Set OPTICS ZERO switch on Indicator Control panel to OFF. Set OPTICS MODE switch to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

10A. Set OPTICS MODE switch on Indicator Control panel to CGC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Complete line (g.2). Uncover the SXT StLOS.

12. Complete lines (h), (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to LO.

15A. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS CONTROLLER SPEED switch to LO.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

NOTE: Step 50 applies to Indicator Control panel 2021290 only. Step 50A applies to all Indicator Control panels except 2021290.

50. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

50A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 51 applies to Indicator Control panel 2021290 only. Step 51A applies to all Indicator Control panels except 2021290.

51. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

51A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

NOTE: Step 53 applies to Indicator Control panel 2021290 only. Step 53A applies to all Indicator Control panels except 2021290.

53. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS TEL TRUN switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

53A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

NOTE: Step 54 applies to Indicator Control panel 2021290 only. Step 54A applies to all Indicator Control panels except 2021290.

54. Set OPTICS TEL TRUN switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

54A. Set OPTICS TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

NOTE: Step 55 applies to Indicator Control panel 2021290 only. Step 55A applies to all Indicator Control panels except 2021290.

55. Set OPTICS TEL TRUN switch to SLAVE TO SXT.

55A. Set OPTICS TELESCOPE TRUNNION switch to SLAVE TO SXT.

NOTE: Step 56 applies to Indicator Control panel 2021290. Step 56A applies to all Indicator Control panels except 2021290.

56. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

56A. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 57 applies to Indicator Control panel 2021290 only. Step 57A applies to all Indicator Control panels except 2021290.

57. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

57A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

---

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

NOTE: Step 64 applies to Indicator Control panel 2021290 only. Step 64A applies to all Indicator Control panels except 2021290.

64. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

64A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90 . Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

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SUBSYSTEM G & N SYSTEM | **ASSY**

71. Repeat step 66.
72. Repeat steps 67, 68, and 69.
73. Complete calculations for SXT StLOS to LLOS parallelism error.
74. Continue normal test sequence at step 9.

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EQUIPMENT TEST
DATA SHEET 1 **OF** 11

JDC NO. 12214
REV. N
INITIAL TDRR 29832

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______

NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4 or 4A	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS*	deg min	▨	______ ______	▨			(c)
8	Convert line (c) to sec using Calibration chart*	sec	▨	( ) ______	▨			(d)
	VDW Reading of WSTLOS*	deg min	▨	______ ______	▨			(e)
	Convert line (e) to sec using calibration chart*	sec	▨	( ) ______	▨			(f)

*VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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JDC NO. 12214
REV. N

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	$\widehat{\text{sec}}$	-10	( ) ______	+10			(g)
11	VDW Reading of WLLOS*	deg min	▨	______ ______	▨	▨	▨	(g.1)
	Convert line (g.1) to sec using Calibration chart*	sec	▨	( ) ______	▨	▨	▨	(g.2)
12	Transfer target calibration angle ϕ_3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨	______ ______ ______	▨	▨	▨	(h)
	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ______	▨	▨	▨	(i)
	Calculate: Line (i) + line (g.2)	sec	▨	( ) ______	▨	▨	▨	(j)
	Convert line (j) to VDW reading using calibration chart **	deg min	▨	______ ______	▨	▨	▨	(k)

*VDW reading decreasing from 360° indicates (+) angle (seconds).
VDW reading increasing from 0° indicates (-) angle (seconds).
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 3 **OF** 11

JDC NO. 12214
REV. N

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	— —.— — — ______	▨	▨	▨	(l)
		Row 2 deg bits	▨	— —.— — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— —.— — — ______	▨	▨	▨	
18	Select bit count 45°	bits	16382	______	16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( ) ______	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits	▨	— —.— — — ______	▨	▨	▨	(p)
		Row 2 deg bits	▨	— —.— — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— —.— — — ______	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (n) is -, add calibration chart indication to 0°0'.
If line (n) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. N

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits	▨		▨	▨	▨	(q)
24	Calculate: Line (m) +00009 bits	bits	▨	( ) ______	▨	▨	▨	(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ______	+2			(s)
	Calculate: Line (j) +30 sec	sec	▨	( ) ______	▨	▨	▨	(t)
	Convert Line (t) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(v)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (t) is -, add calibration chart indication to 0°0'.
If line (t) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV. N

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits	▨	______	▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( ) ______	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ______	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( ) ______	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(aa)
32	Record CMC NAV DSKY Row 2 display * 45° (+60")	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(ab)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
33	Select bit count 45° (+60")	bits	▨	______	▨	▨	▨	(ac)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (z) is -, add calibration chart indication to 0°0'.
If line (z) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 6 OF 11

JDC
NO. 12214
REV. N

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits	▨	( ) ______	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (+60")	bits	-2	( ) ______	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( ) ______	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(ag)
37	Record CMC NAV DSKY Row 2 display * 45° (-30")	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(ah)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (af) is -, add calibration chart indication to 0°0'.
If line (af) is +, subtract calibration chart indication from 359°60'.

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JDC
NO. 12214
REV. N

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	______	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ______	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ______	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ______	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * 45° (-90")	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(an)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (al) is -, add calibration chart indication to 0°0'.
If line (al) is +, subtract calibration chart indication from 359°60'.

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DATA SHEET 8 OF 11

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	______	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( )______	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( )______	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( )______	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display * 45° (-60")	Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	(at)
		Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (ar) is -, add calibration chart indication to 0°0'.
If line (ar) is +, subtract calibration chart indication from 359°60'.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	
48	Select bit count 45° (-60)")	bits	▨	______	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( )______	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( )______	+2			(aw)
53 or 53A	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54 or 54A	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	° ' " Δ1 - 90° 00' 00.0"	270° 00' 00.0" Δ2 - ______° ' "	270° 00' 00.0" Δ3 - ______° ' "
	° ' " Δ4 - 90° 00' 00.0"	° ' " Δ5 - 90° 00' 00.0"	270° 00' 00.0" Δ6 - ______° ' "
	270° 00' 00.0" Δ7 - ______° ' "	° ' " Δ8 - 90° 00' 00.0"	° ' " Δ9 - 90° 00' 00.0"
	270° 00' 00.0" Δ10 - ______° ' "	270° 00' 00.0" Δ11 - ______° ' "	° ' " Δ12 - 90° 00' 00.0"
	° ' " Δ13 - 90° 00' 00.0"	270° 00' 00.0" Δ14 - ______° ' "	270° 00' 00.0" Δ15 - ______° ' "
	° ' " Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ______		

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EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
REV. N

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
72	° ' " Δ1 - 90° 00' 00.0"	270° 00' 00.0" Δ2 - ______	270° 00' 00.0" Δ3 - ______° ' "
	° ' " Δ4 - 90° 00' 00.0"	° ' " Δ5 - 90° 00' 00.0"	270° 00' 00.0" Δ6 - ______° ' "
	270° 00' 00.0" Δ7 - ______° ' "	° ' " Δ8 - 90° 00' 00.0"	° ' " Δ9 - 90° 00' 00.0"
	270° 00' 00.0" Δ10 - ______° ' "	270° 00' 00.0" Δ11 - ______° ' "	° ' " Δ12 - 90° 00' 00.0"
	° ' " Δ13 - 90° 00' 00.0"	270° 00' 00.0" Δ14 - ______° ' "	270° 00' 00.0" Δ15 - ______° ' "
	° ' " Δ16 - 90° 00' 00"		
73	$\frac{\Sigma\Delta(72)}{\Sigma\Delta(67,\ 68)}$ = -______ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST
JDC 12214 REV. P PAGE 1 OF 9
INITIAL TDRR 29882 D.S. PGS. 11
SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION SXT LOS parallelism and SXT St LOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-
L	9-28-67	34741	1,2,3,6,7,8	1,9	EA	-
M	10-26-67	34934	3	7	EA	-
N	3-19-68	35891	1,3	1-8,11	EA	-
P	5-2-68	36154	1,2,5,8	-	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 1. Insure that JDC 19128 has been performed within the last six months.

2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

3. If a Fresh Start (VERB 36 ENTR) is performed at any time during performance of this JDC, set OPTICS ZERO switch (Indicator Control panel 2021290) to OFF and then to ON and wait 18 seconds before proceeding; or set OPTICS MODE switch (all Indicator Control panels except 2021290) to MAN and then to ZERO and wait 18 seconds before proceeding.

NOTE: 1. The G & N Mounting Fixture shall be set at the 0.0° position.

2. Step 1 applies to Indicator Control panel 2021290 only. Step 1A applies to all Indicator Control panels except 2021290.

1. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS ZERO switch is set to OFF.

1A. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and that OPTICS TRACKER switch is set to OFF.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Set OPTICS COUPLING switch to DIRECT and set OPTICS SPEED switch to HI.

2A. Set OPTICS CONTROLLER COUPLING switch to DIRECT and set OPTICS CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control Panel to MAN.

3A. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 4 applies to Indicator Control panel 2021290 only. Step 4A applies to all Indicator Control panels except 2021290.

4. Set OPTICS ZERO switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

4A. Set OPTICS MODE switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

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9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

NOTE: Step 10 applies to Indicator Control panel 2021290 only. Step 10A applies to all Indicator Control panels except 2021290.

10. Set OPTICS ZERO switch on Indicator Control panel to OFF. Set OPTICS MODE switch to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

10A. Set OPTICS MODE switch on Indicator Control panel to CGC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g. 1). Complete line (g. 2). Uncover the SXT StLOS.

12. Complete lines (h), (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to LO.

15A. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS CONTROLLER SPEED switch to LO.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times,

recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

49A. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 50 applies to
Indicator Control panel
2021290 only. Step 50A
applies to all Indicator
Control panels except
2021290.

50. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

50A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 51 applies to
Indicator Control panel
2021290 only. Step 51A
applies to all Indicator
Control panels except
2021290.

51. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

51A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

NOTE: Step 53 applies to
Indicator Control panel
2021290 only. Step 53A
applies to all Indicator
Control panels except
2021290.

53. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS TEL TRUN switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

53A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

NOTE: Step 54 applies to
Indicator Control panel
2021290 only. Step 54A
applies to all Indicator
Control panels except
2021290.

54. Set OPTICS TEL TRUN switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

54A. Set OPTICS TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

NOTE: Step 55 applies to
Indicator Control panel
2021290 only. Step 55A
applies to all Indicator
Control panels except
2021290.

55. Set OPTICS TEL TRUN switch to SLAVE TO SXT.

55A. Set OPTICS TELESCOPE TRUNNION switch to SLAVE TO SXT.

NOTE: Step 56 applies to
Indicator Control panel
2021290. Step 56A applies to all Indicator
Control panels except 2021290.

56. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

56A. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 57 applies to
Indicator Control panel
2021290 only. Step 57A
applies to all Indicator
Control panels except
2021290.

57. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

57A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

63A. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 64 applies to
Indicator Control panel
2021290 only. Step 64A
applies to all Indicator
Control panels except
2021290.

64. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

64A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

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SUBSYSTEM G & N SYSTEM | ASSY

71. Repeat step 66.
72. Repeat steps 67, 68, and 69.
73. Complete calculations for SXT StLOS to LLOS parallelism error.
74. Continue normal test sequence at step 9.

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EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. P
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4 or 4A	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS*	deg min	▨	______ ______	▨			(c)
8	Convert line (c) to sec using Calibration chart*	sec	▨	( ) ______	▨			(d)
	VDW Reading of WSTLOS*	deg min	▨	______ ______	▨			(e)
	Convert line (e) to sec using calibration chart*	sec	▨	( ) ______	▨			(f)

*VDW reading decreasing from 360° indicates (+) angle (seconds).
VDW reading increasing from 0° indicates (-) angle (seconds).

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	sec	-10	( ) ______	+10			(g)
11	VDW Reading of WLLOS*	deg min	▨	______ ______	▨	▨	▨	(g.1)
	Convert line (g.1) to sec using Calibration chart*	sec	▨	( ) ______	▨	▨	▨	(g.2)
12	Transfer target calibration angle #3 from JDC 12223 Item C.1 to nearest whole second	deg min sec	▨	______ ______ ______	▨	▨	▨	(h)
	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ______	▨	▨	▨	(i)
	Calculate: Line (i) + line (g.2)	sec	▨	( ) ______	▨	▨	▨	(j)
	Convert line (j) to VDW reading using calibration chart **	deg min	▨	______ ______	▨	▨	▨	(k)

*VDW reading decreasing from 360° indicates (+) angle (seconds).
VDW reading increasing from 0° indicates (-) angle (seconds).
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(l)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
18	Select bit count 45°	bits	16382	______	16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( ) ______	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	(p)
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ______	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (n) is -, add calibration chart indication to 0°0'.
If line (n) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits	▨	____	▨	▨	▨	(q)
24	Calculate: Line (m) +00009 bits	bits	▨	( ) ____	▨	▨	▨	(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ____	+2			(s)
	Calculate: Line (j) +30 sec	sec	▨	( ) ____	▨	▨	▨	(t)
	Convert Line (t) to VDW reading using calibration chart**	deg min	▨	____ ____	▨	▨	▨	(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	(v)
		Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (t) is -, add calibration chart indication to 0°0'.
If line (t) is +, subtract calibration chart indication from 359°60'.

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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits	▨	____	▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( ) ____	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ____	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( ) ____	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart**	deg min	▨	____ ____	▨	▨	▨	(aa)
32	Record CMC NAV DSKY Row 2 display * 45° (+60")	Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	(ab)
		Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	
33	Select bit count 45° (+60")	bits	▨	____	▨	▨	▨	(ac)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (z) is -, add calibration chart indication to 0°0'.
If line (z) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits	▨	( ) ____	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (+60")	bits	-2	( ) ____	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( ) ____	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart**	deg min	▨	____ ____	▨	▨	▨	(ag)
37	Record CMC NAV DSKY Row 2 display * 45° (-30")	Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	(ah)
		Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (af) is -, add calibration chart indication to 0°0'.
If line (af) is +, subtract calibration chart indication from 359°60'.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits	▨	____	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ____	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ____	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ____	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart**	deg min	▨	____ ____	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * 45° (-90")	Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	(an)
		Row 2 deg bits	▨	__ __ . __ __ __ ____	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (al) is -, add calibration chart indication to 0°0'.
If line (al) is +, subtract calibration chart indication from 359°60'.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	______	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( ) ______	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ______	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( ) ______	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display * 45° (-60")	Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	(at)
		Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (ar) is -, add calibration chart indication to 0°0'.
If line (ar) is +, subtract calibration chart indication from 359°60'.

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	___ . ___ ______	▨	▨	▨	
48	Select bit count 45° (-60)')	bits	▨	______	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( ) ______	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ______	+2			(aw)
53 or 53A	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54 or 54A	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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EQUIPMENT TEST
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ______		

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
72	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00"		
73	ΣΔ(72) = ΣΔ(67, 68) = -______ SLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV. R PAGE 1 OF 9
INITIAL TDRR 29882 D.S. PGS 11

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION SXT LOS parallelism and SXT St LOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-1-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-
L	9-28-67	34741	1,2,3,6,7,8	1,9	EA	-
M	10-26-67	34934	3	7	EA	-
N	3-19-68	35891	1,3	1-8,11	EA	-
P	5-2-68	36154	1,2,5,8	-	EA	-
R	10-21-68	36929	1	-	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 1. Insure that JDC 19128 has been performed within the last six months. 2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops. 3. If a Fresh Start (VERB 36 ENTR) is performed at any time during performance of this JDC, set OPTICS ZERO switch (Indicator Control panel 2021290) to OFF and then to ON and wait 18 seconds before proceeding; or set OPTICS MODE switch (all Indicator Control panels except 2021290) to MAN and then to ZERO and wait 18 seconds before proceeding.

NOTE: 1. Perform JDC 12215 to establish a Master Initialization condition. Place the G & N Mounting Fixture in the 0.0° position immediately after the IMU is coarse aligned to zero degree. 2. Step 1 applies to Indicator Control panel 2021290 only. Step 1A applies to all Indicator Control panels except 2021290.

1. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS

VERIFICATION WITH SDL REQUIRED BEFORE USE

ZERO switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

1A. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and that OPTICS TRACKER switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Set OPTICS COUPLING switch to DIRECT and set OPTICS SPEED switch to HI.

2A. Set OPTICS CONTROLLER COUPLING switch to DIRECT and set OPTICS CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control Panel to MAN.

3A. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 4 applies to Indicator Control panel 2021290 only. Step 4A applies to all Indicator Control panels except 2021290.

4. Set OPTICS ZERO switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

4A. Set OPTICS MODE switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

6. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

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7. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 8 is not within tolerance, perform the alternate procedure given in steps 65 through 74 to verify that an out-of-tolerance condition exists.

8. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

9. Rotate the VDW to the other base (setting knob points right). Set the VDW dial to zero.

NOTE: Step 10 applies to Indicator Control panel 2021290 only. Step 10A applies to all Indicator Control panels except 2021290.

10. Set OPTICS ZERO switch on Indicator Control panel to OFF. Set OPTICS MODE switch to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

10A. Set OPTICS MODE switch on Indicator Control panel to CGC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

11. Cover the SXT StLOS. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Complete line (g.2). Uncover the SXT StLOS.

12. Complete lines (h), (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

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15. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to LO.

15A. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS CONTROLLER SPEED switch to LO.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

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48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

49A. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 50 applies to
Indicator Control panel
2021290 only. Step 50A
applies to all Indicator
Control panels except
2021290.

50. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

50A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 51 applies to
Indicator Control panel
2021290 only. Step 51A
applies to all Indicator
Control panels except
2021290.

51. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

51A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

NOTE: Step 53 applies to
Indicator Control panel
2021290 only. Step 53A
applies to all Indicator
Control panels except
2021290.

53. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS TEL TRUN switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

53A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

NOTE: Step 54 applies to
Indicator Control panel
2021290 only. Step 54A
applies to all Indicator
Control panels except
2021290.

54. Set OPTICS TEL TRUN switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

54A. Set OPTICS TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

NOTE: Step 55 applies to
Indicator Control panel
2021290 only. Step 55A
applies to all Indicator
Control panels except
2021290.

55. Set OPTICS TEL TRUN switch to SLAVE TO SXT.

55A. Set OPTICS TELESCOPE TRUNNION switch to SLAVE TO SXT.

NOTE: Step 56 applies to
Indicator Control panel
2021290. Step 56A applies to all Indicator
Control panels except 2021290.

56. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

56A. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 57 applies to
Indicator Control panel
2021290 only. Step 57A
applies to all Indicator
Control panels except
2021290.

57. Set OPTICS SPEED switch to HI and using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

57A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

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60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

63A. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 64 applies to
Indicator Control panel
2021290 only. Step 64A
applies to all Indicator
Control panels except
2021290.

64. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

64A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

ALTERNATE SXT LOS PARALLELISM PROCEDURE

65. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

66. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

67. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

68. Reverse and plunge the theodolite telescope and repeat step 67.

69. Repeat steps 67 and 68 for seven additional pairs of readings. After each time that step 68 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

70. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

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SUBSYSTEM G & N SYSTEM | ASSY

71. Repeat step 66.
72. Repeat steps 67, 68, and 69.
73. Complete calculations for SXT StLOS to LLOS parallelism error.
74. Continue normal test sequence at step 9.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV. R
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4 or 4A	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
7	VDW Reading of WLLOS*	deg min	▨	______ ______	▨			(c)
8	Convert line (c) to sec using Calibration chart*	sec	▨	( ) ______	▨			(d)
	VDW Reading of WSTLOS*	deg min	▨	______ ______	▨			(e)
	Convert line (e) to sec using calibration chart*	sec	▨	( ) ______	▨			(f)

*VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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DATA SHEET 2 OF 11

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B. 19. StLOS-LLOS parallelism	$\widehat{\text{sec}}$	-10	( ) ______	+10			(g)
11	VDW Reading of WLLOS*	deg min	▨	______ ______	▨	▨	▨	(g. 1)
	Convert line (g. 1) to sec using Calibration chart*	sec	▨	( ) ______	▨	▨	▨	(g. 2)
12	Transfer target calibration angle ϕ_3 from JDC 12223 Item C. 1 to nearest whole second	deg min sec	▨	______ ______ ______	▨	▨	▨	(h)
	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ______	▨	▨	▨	(i)
	Calculate: Line (i) + line (g. 2)	sec	▨	( ) ______	▨	▨	▨	(j)
	Convert line (j) to VDW reading using calibration chart **	deg min	▨	______ ______	▨	▨	▨	(k)

*VDW reading decreasing from 360° indicates (+) angle (seconds).
VDW reading increasing from 0° indicates (-) angle (seconds).
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV. R

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	(l)
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	
18	Select bit count 45°	bits	16382	______	16386			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( ) ______	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45°(+90")	Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	(p)
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (n) is -, add calibration chart indication to 0°0'.
If line (n) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. R

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ______				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ______	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ______				(t)
	Convert Line (t) to VDW reading using calibration chart**	deg min		______ ______				(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits		— — . — — — — ______				(v)
		Row 2 deg bits		— — . — — — — ______				
		Row 2 deg bits		— — . — — — — ______				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (t) is -, add calibration chart indication to 0°0'.
If line (t) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV. R

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		______				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) ______				(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ______	+2			(y)
	Calculate: Line (j) +60 sec	sec		( ) ______				(z)
	Convert Line (z) to VDW reading using calibration chart**	deg min		______ ______				(aa)
32	Record CMC NAV DSKY Row 2 display * 45° (+60")	Row 2 deg bits		— — . — — — — ______				(ab)
		Row 2 deg bits		— — . — — — — ______				
		Row 2 deg bits		— — . — — — — ______				
33	Select bit count 45° (+60")	bits		______				(ac)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (z) is -, add calibration chart indication to 0°0'.
If line (z) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) ______				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (+60")	bits	-2	( ) ______	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) ______				(af)
	Convert Line (af) to VDW reading using calibration chart**	deg min		______ ______				(ag)
37	Record CMC NAV DSKY Row 2 display * 45° (-30")	Row 2 deg bits		— — . — — — — ______				(ah)
		Row 2 deg bits		— — . — — — — ______				
		Row 2 deg bits		— — . — — — — ______				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (af) is -, add calibration chart indication to 0°0'.
If line (af) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 7 OF 11

JDC
NO. 12214
REV. R

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits		______				(ai)
39	Calculate: Line (m) -00003 bits	bits		( ) ______				(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ______	+2			(ak)
	Calculate: Line (j) -90 sec	sec		( ) ______				(al)
	Convert Line (al) to VDW reading using calibration chart**	deg min		______ ______				(am)
42	Record CMC NAV DSKY Row 2 display * 45° (-90")	Row 2 deg bits		— — . — — — — ______				(an)
		Row 2 deg bits		— — . — — — — ______				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (al) is -, add calibration chart indication to 0°0'.
If line (al) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 8 OF 11

JDC NO. 12214
REV. R

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	________	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( ) ________	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ________	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( ) ________	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart**	deg min	▨	________ ________	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display * 45° (-60")	Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	(at)
		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (ar) is -, add calibration chart indication to 0°0'.
If line (ar) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 9 OF 11

JDC NO. 12214
REV. R

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	
48	Select bit count 45° (-60")	bits	▨	________	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( ) ________	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ________	+2			(aw)
53 or 53A	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54 or 54A	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC NO. 12214
REV. R

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
67, 68	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0" ____° ____' ____"	Δ3 - 270° 00' 00.0" ____° ____' ____"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0" ____° ____' ____"
	Δ7 - 270° 00' 00.0" ____° ____' ____"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0" ____° ____' ____"	Δ11 - 270° 00' 00.0" ____° ____' ____"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0" ____° ____' ____"	Δ15 - 270° 00' 00.0" ____° ____' ____"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ________		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC NO. 12214
REV. R

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
72	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0" ________	Δ3 - 270° 00' 00.0" ____° ____' ____"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0" ____° ____' ____"
	Δ7 - 270° 00' 00.0" ____° ____' ____"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0" ____° ____' ____"	Δ11 - 270° 00' 00.0" ____° ____' ____"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0" ____° ____' ____"	Δ15 - 270° 00' 00.0" ____° ____' ____"
	Δ16 - 90° 00' 00"		
73	$\frac{\Sigma\Delta(72)}{\Sigma\Delta(67, 68)}$ = -________ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 REV. S PAGE 1 OF 9
INITIAL TDRR 29882 D.S. PGS 11

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION SXT LOS parallelism and SXT St LOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-
L	9-28-67	34741	1,2,3,6,7,8	1,9	EA	-
M	10-26-67	34934	3	7	EA	-
N	3-19-68	35891	1,3	1-8,11	EA	-
P	5-2-68	36154	1,2,5,8	-	EA	-
R	10-21-68	36929	1	-	EA	-
S	12-10-68	37113	2,3,8,9	All	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 1. Insure that JDC 19128 has been performed within the last six months. 2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops. 3. If a Fresh Start (VERB 36 ENTR) is performed at any time during performance of this JDC, set OPTICS ZERO switch (Indicator Control panel 2021290) to OFF and then to ON and wait 18 seconds before proceeding; or set OPTICS MODE switch (all Indicator Control panels except 2021290) to MAN and then to ZERO and wait 18 seconds before proceeding.

NOTE: 1. Perform JDC 12215 to establish a Master Initialization condition. Place the G & N Mounting Fixture in the 0.0° position immediately after the IMU is coarse aligned to zero degree. 2. Step 1 applies to Indicator Control panel 2021290 only. Step 1A applies to all Indicator Control panels except 2021290.

1. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS

VERIFICATION WITH SIDL REQUIRED BEFORE USE

ZERO switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

1A. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and that OPTICS TRACKER switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Set OPTICS COUPLING switch to DIRECT and set OPTICS SPEED switch to HI.

2A. Set OPTICS CONTROLLER COUPLING switch to DIRECT and set OPTICS CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control panel to MAN.

4. through 7. Deleted.

8. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G&N Mounting Fixture until the single vertical reticle line is adjacent to the dot of target number 1.

9. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the horizontal plane (setting knob points right). Set the VDW dial to zero.

NOTE: Step 10 applies to Indicator Control panel 2021290 only. Step 10A applies to all Indicator Control panels except 2021290.

10. Set OPTICS MODE switch to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

10A. Set OPTICS MODE switch on Indicator Control panel to CGC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

11. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical

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reticle line of target number 1. Record the VDW dial reading on line (g.1). Complete line (g.2). Uncover the SXT StLOS.

12. Complete lines (h), (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to LO.

15A. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS CONTROLLER SPEED switch to LO.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (1) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (1) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target

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number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three

counts are different, record the count which falls between the smallest and the largest on line (ac).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

49A. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 50 applies to Indicator Control panel 2021290 only. Step 50A applies to all Indicator Control panels except 2021290.

50. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

50A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 51 applies to Indicator Control panel 2021290 only. Step 51A applies to all Indicator Control panels except 2021290.

51. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

51A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

NOTE: Step 53 applies to Indicator Control panel 2021290 only. Step 53A applies to all Indicator Control panels except 2021290.

53. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS TEL TRUN switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

53A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

NOTE: Step 54 applies to Indicator Control panel 2021290 only. Step 54A applies to all Indicator Control panels except 2021290.

54. Set OPTICS TEL TRUN switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

54A. Set OPTICS TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

NOTE: Step 55 applies to Indicator Control panel 2021290 only. Step 55A applies to all Indicator Control panels except 2021290.

55. Set OPTICS TEL TRUN switch to SLAVE TO SXT.

55A. Set OPTICS TELESCOPE TRUNNION switch to SLAVE TO SXT.

NOTE: Step 56 applies to Indicator Control panel 2021290. Step 56A applies to all Indicator Control panels except 2021290.

56. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

56A. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 57 applies to Indicator Control panel 2021290 only. Step 57A applies to all Indicator Control panels except 2021290.

57. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

57A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 65 applies to Indicator Control panel 2021290 only. Step 65A applies to all Indicator Control panels except 2021290.

65. Set OPTICS ZERO switch to ZERO. After one minute, perform following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

65A. Set OPTICS MODE switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

66. Place the VDW in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

67. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

NOTE: If coincidence cannot be achieved in step 67 by adjusting the G & N Mounting Fixture, target number 1 may be adjusted in azimuth as necessary to achieve coincidence.

68. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 69 is not within tolerance, perform the alternate procedure given in steps 72 through 80 to verify that an out-of-tolerance condition exists.

69. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

NOTE: Step 70 applies to Indicator Control panel 2021290 only. Step 70A applies to all Indicator Control panels except 2021290.

70. Set OPTICS ZERO switch on Indicator Control panel to OFF.

70A. Set OPTICS MODE switch on Indicator Control panel to MAN.

71. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

ALTERNATE SXT LOS PARALLELISM PROCEDURE

72. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

73. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

74. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

75. Reverse and plunge the theodolite telescope and repeat step 74.

76. Repeat steps 74 and 75 for seven additional pairs of readings. After each time that step 75 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

77. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

78. Repeat step 73.

79. Repeat steps 74, 75, and 76.

80. Complete calculations for SXT StLOS to LLOS parallelism error. ______

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV S
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	sec	-10	( ) ______	+10			(g)
11	VDW Reading of WLLOS*	deg min		______ ______				(g.1)
	Convert line (g.1) to sec using Calibration chart*	sec		( ) ______				(g.2)
12	Transfer target calibration angle ∮3 from JDC 12223 Item C.1 to nearest whole second	deg min sec		______ ______ ______				(h)

*VDW reading decreasing from 360° indicates (+) angle (seconds).
VDW reading increasing from 0° indicates (-) angle (seconds).

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV S

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
12 (cont)	Calculate: 45° - line (h) to nearest second	sec		( ) ______				(i)
	Calculate: Line (i) + line (g.2)	sec		( ) ______				(j)
	Convert line (j) to VDW reading using calibration chart **	deg min		______ ______				(k)
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits		— — · — — — ______				(l)
		Row 2 deg bits		— — · — — — ______				
		Row 2 deg bits		— — · — — — ______				
18	Select bit count 45°	bits	16382	______	16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( ) ______				(n)
	Convert Line (n) to VDW reading using calibration chart***	deg min		______ ______				(o)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.
***If line (n) is -, add calibration chart indication to 0°0'.
If line (n) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV S

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		— — · — — — ______				(p)
		Row 2 deg bits		— — · — — — ______				
		Row 2 deg bits		— — · — — — ______				
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ______				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ______	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ______				(t)
	Convert Line (t) to VDW reading using calibration chart**	deg min		______ ______				(u)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (t) is -, add calibration chart indication to 0°0'.
If line (t) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. S

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	(v)
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
28	Select bit count 45° (+30")	bits	▨	________	▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( )________	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( )________	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( )________	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart**	deg min	▨	________ ________	▨	▨	▨	(aa)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (z) is -, add calibration chart indication to 0°0'.
If line (z) is +, subtract calibration chart indication from 359°60'.

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FORM 00155
New 9-30-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV. S

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
32	Record CMC NAV DSKY Row 2 display * 45° (+60")	Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	(ab)
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
33	Select bit count 45° (+60")	bits	▨	________	▨	▨	▨	(ac)
34	Calculate: Line (m) + 00006 bits	bits	▨	( )________	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (+60")	bits	-2	( )________	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( )________	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart**	deg min	▨	________ ________	▨	▨	▨	(ag)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (af) is -, add calibration chart indication to 0°0'.
If line (af) is +, subtract calibration chart indication from 359°60'.

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FORM 00155
New 9-30-65

APOLLO G&N
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JDC
NO. 12214
REV. S

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
37	Record CMC NAV DSKY Row 2 display * 45° (-30")	Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	(ah)
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
38	Select bit count 45° (-30")	bits	▨	________	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( )________	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( )________	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( )________	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart**	deg min	▨	________ ________	▨	▨	▨	(am)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (al) is -, add calibration chart indication to 0°0'.
If line (al) is +, subtract calibration chart indication from 359°60'.

DATE 30 JUN 66

FORM 00155
New 9-30-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 11

JDC
NO. 12214
REV. S

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	Record CMC NAV DSKY Row 2 display * 45° (-90")	Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	(an)
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — . — — — ________	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	________	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( )________	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( )________	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( )________	▨	▨	▨	(ar)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE 30 JUN 66

FORM 00155
New 9-30-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 11

JDC
NO. 12214
REV. S

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
44 (cont)	Convert Line (ar) to VDW reading using calibration chart**	deg min	▨	________ ________	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display * 45° (-60")	Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	(at)
		Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	
		Row 2 deg bits	▨	___ . ____ ________	▨	▨	▨	
48	Select bit count 45° (-60)')	bits	▨	________	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( )________	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( )________	+2			(aw)
53 or 53A	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (ar) is -, add calibration chart indication to 0°0'.
If line (ar) is +, subtract calibration chart indication from 359°60'.

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DATA SHEET 9 OF 11

JDC
NO. 12214
REV. S

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
54 or 54A	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct					
63	Image resolution	▨	clear and distinct					
65 or 65A	DSKY Row 2 display (Trunnion angle)	deg	-00007	( )________	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( )________	+00002			(b)
68	VDW Reading of WLLOS*	deg min	▨	________ ________	▨			(c)
69	Convert line (c) to sec using Calibration chart*	sec	▨	( )________	▨			(d)
	VDW Reading of WSTLOS*	deg min	▨	________ ________	▨			(e)
	Convert line (e) to sec using calibration chart*	sec	▨	( )________	▨			(f)

*VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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DATA SHEET 10 OF 11

JDC
NO. 12214
REV. S

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
74, 75	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ________		

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FORM 00145

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
REV. S

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
79	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00"		
80	$\frac{\Sigma\Delta(72)}{\Sigma\Delta(67, 68)}$ = -________ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

DATE 30 JUN 66

JOB OPTICS POSITIONAL ACCURACY TEST	**JDC** 12214 **REV.** T **PAGE** 1 **OF** 9 **INITIAL TDRR** 29882 **D.S. PGS** 11
SUBSYSTEM G & N SYSTEM	**ASSY.**

DESCRIPTION SXT LOS parallelism and SXT St LOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-
L	9-28-67	34741	1,2,3,6,7,8	1,9	EA	-
M	10-26-67	34934	3	7	EA	-
N	3-19-68	35891	1,3	1-8,11	EA	-
P	5-2-68	36154	1,2,5,8	-	EA	-
R	10-21-68	36929	1	-	EA	-
S	12-10-68	37113	2,3,8,9	All	EA	-
T	12-27-68	37153	2	-	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 1. Insure that JDC 19128 has been performed within the last six months. 2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops. 3. If a Fresh Start (VERB 36 ENTR) is performed at any time during performance of this JDC, set OPTICS ZERO switch (Indicator Control panel 2021290) to OFF and then to ON and wait 18 seconds before proceeding; or set OPTICS MODE switch (all Indicator Control panels except 2021290) to MAN and then to ZERO and wait 18 seconds before proceeding.

NOTE: 1. Perform JDC 12215 to establish a Master Initialization condition. Place the G & N Mounting Fixture in the 0.0° position immediately after the IMU is coarse aligned to zero degree. 2. Step 1 applies to Indicator Control panel 2021290 only. Step 1A applies to all Indicator Control panels except 2021290.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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1. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS ZERO switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

1A. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and that OPTICS TRACKER switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Set OPTICS COUPLING switch to DIRECT and set OPTICS SPEED switch to HI.

2A. Set OPTICS CONTROLLER COUPLING switch to DIRECT and set OPTICS CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control panel to MAN.

NOTE: Step 4 applies to Indicator Control panel 2021290 only. Step 4A applies to all Indicator Control panels except 2021290.

4. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, return OPTICS ZERO switch to OFF.

4A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, return OPTICS MODE switch to MAN.

5. through 7. Deleted

8. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G&N Mounting Fixture until the single vertical reticle line is adjacent to the dot of target number 1.

9. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the horizontal plane (setting knob points right). Set the VDW dial to zero.

NOTE: Step 10 applies to Indicator Control panel 2021290 only. Step 10A applies to all Indicator Control panels except 2021290.

10. Set OPTICS MODE switch to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR

---

b. +27000 ENTR

c. +45000 ENTR

Wait until optics stop driving before proceeding.

10A. Set OPTICS MODE switch on Indicator Control panel to CGC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR

b. +27000 ENTR

c. +45000 ENTR

Wait until optics stop driving before proceeding.

11. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g. 1). Complete line (g. 2). Uncover the SXT StLOS.

12. Complete lines (h), (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to LO.

15A. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS CONTROLLER SPEED switch to LO.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

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22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

49A. Using Optics Hand Controller, position the SXT Trunnion between 0^o and 10^o as indicated by the Trunnion TPAC.

NOTE: Step 50 applies to Indicator Control panel 2021290 only. Step 50A applies to all Indicator Control panels except 2021290.

50. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

50A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 51 applies to Indicator Control panel 2021290 only. Step 51A applies to all Indicator Control panels except 2021290.

51. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

51A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

NOTE: Step 53 applies to Indicator Control panel 2021290 only. Step 53A applies to all Indicator Control panels except 2021290.

53. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS TEL TRUN switch to 25^o. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

53A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS TELESCOPE TRUNNION switch to 25^o. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

NOTE: Step 54 applies to Indicator Control panel 2021290 only. Step 54A applies to all Indicator Control panels except 2021290.

54. Set OPTICS TEL TRUN switch to 0^o. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

54A. Set OPTICS TELESCOPE TRUNNION switch to 0^o. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

NOTE: Step 55 applies to Indicator Control panel 2021290 only. Step 55A applies to all Indicator Control panels except 2021290.

55. Set OPTICS TEL TRUN switch to SLAVE TO SXT.

55A. Set OPTICS TELESCOPE TRUNNION switch to SLAVE TO SXT.

NOTE: Step 56 applies to Indicator Control panel 2021290. Step 56A applies to all Indicator Control panels except 2021290.

56. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

56A. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 57 applies to Indicator Control panel 2021290 only. Step 57A applies to all Indicator Control panels except 2021290.

57. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

57A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Using Optics Hand Controller, position the SXT Trunnion between 0^o and 10^o as indicated by the Trunnion TPAC.

NOTE: Step 65 applies to Indicator Control panel 2021290 only. Step 65A applies to all Indicator Control panels except 2021290.

65. Set OPTICS ZERO switch to ZERO. After one minute, perform following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

65A. Set OPTICS MODE switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

66. Place the VDW in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

67. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

NOTE: If coincidence cannot be achieved in step 67 by adjusting the G & N Mounting Fixture, target number 1 may be adjusted in azimuth as necessary to achieve coincidence.

68. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 69 is not within tolerance, perform the alternate procedure given in steps 72 through 80 to verify that an out-of-tolerance condition exists.

69. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

NOTE: Step 70 applies to Indicator Control panel 2021290 only. Step 70A applies to all Indicator Control panels except 2021290.

70. Set OPTICS ZERO switch on Indicator Control panel to OFF.

70A. Set OPTICS MODE switch on Indicator Control panel to MAN.

71. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

ALTERNATE SXT LOS PARALLELISM PROCEDURE

72. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV T PAGE 9 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

73. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

74. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

75. Reverse and plunge the theodolite telescope and repeat step 74.

76. Repeat steps 74 and 75 for seven additional pairs of readings. After each time that step 75 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

77. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

78. Repeat step 73.

79. Repeat steps 74, 75, and 76.

80. Complete calculations for SXT StLOS to LLOS parallelism error.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV T
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	sec	-10	( ) ______	+10			(g)
11	VDW Reading of WLLOS*	deg min		______ ______				(g.1)
	Convert line (g.1) to sec using Calibration chart*	sec		( ) ______				(g.2)
12	Transfer target calibration angle #3 from JDC 12223 Item C.1 to nearest whole second	deg min sec		______ ______ ______				(h)

*VDW reading decreasing from 360° indicates (+) angle (seconds).
VDW reading increasing from 0° indicates (-) angle (seconds).

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV. T

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
12 (cont)	Calculate: 45° - line (h) to nearest second	sec		( ) ______				(i)
	Calculate: Line (i) + line (g.2)	sec		( ) ______				(j)
	Convert line (j) to VDW reading using calibration chart **	deg min		______ ______				(k)
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits		__ __.__ __ __ ______				(l)
		Row 2 deg bits		__ __.__ __ __ ______				
		Row 2 deg bits		__ __.__ __ __ ______				
18	Select bit count 45°	bits	16382	______	16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( ) ______				(n)
	Convert Line (n) to VDW reading using calibration chart***	deg min		______ ______				(o)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (j) is -, add calibration chart indication to $0^{\circ}0'$.
If line (j) is +, subtract calibration chart indication from $359^{\circ}60'$.
***If line (n) is -, add calibration chart indication to $0^{\circ}0'$.
If line (n) is +, subtract calibration chart indication from $359^{\circ}60'$.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV. T

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		__ __.__ __ __ ______				(p)
		Row 2 deg bits		__ __.__ __ __ ______				
		Row 2 deg bits		__ __.__ __ __ ______				
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ______				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ______	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ______				(t)
	Convert Line (t) to VDW reading using calibration chart**	deg min		______ ______				(u)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (t) is -, add calibration chart indication to $0^{\circ}0'$.
If line (t) is +, subtract calibration chart indication from $359^{\circ}60'$.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. T

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	(v)
		Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	
28	Select bit count 45° (+30")	bits	▨	________	▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( ) ________	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ________	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( ) ________	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart**	deg min	▨	________ ________	▨	▨	▨	(aa)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (z) is -, add calibration chart indication to 0°0'.
If line (z) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV. T

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
32	Record CMC NAV DSKY Row 2 display * 45° (+60")	Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	(ab)
		Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	
33	Select bit count 45° (+60")	bits	▨	________	▨	▨	▨	(ac)
34	Calculate: Line (m) + 00006 bits	bits	▨	( ) ________	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (+60")	bits	-2	( ) ________	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( ) ________	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart**	deg min	▨	________ ________	▨	▨	▨	(ag)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (af) is -, add calibration chart indication to 0°0'.
If line (af) is +, subtract calibration chart indication from 359°60'.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
37	Record CMC NAV DSKY Row 2 display * 45° (-30")	Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	(ah)
		Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	
38	Select bit count 45° (-30")	bits	▨	________	▨	▨	▨	(ai)
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ________	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ________	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ________	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart**	deg min	▨	________ ________	▨	▨	▨	(am)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (al) is -, add calibration chart indication to 0°0'.
If line (al) is +, subtract calibration chart indication from 359°60'.

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DATA SHEET 7 OF 11

JDC
NO. 12214
REV. T

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	Record CMC NAV DSKY Row 2 display * 45° (-90")	Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	(an)
		Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — — . — — — — ________	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	________	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( ) ________	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ________	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( ) ________	▨	▨	▨	(ar)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
44 (cont)	Convert Line (ar) to VDW reading using calibration chart**	deg min		____ ____				(as)
47	Record CMC NAV DSKY Row 2 display * 45° (-60")	Row 2 deg bits		_ _ _ . _ _ _ _ ____				(at)
		Row 2 deg bits		_ _ _ . _ _ _ _ ____				
		Row 2 deg bits		_ _ _ . _ _ _ _ ____				
48	Select bit count 45° (-60)')	bits		____				(au)
49	Calculate: Line (m) -00006 bits	bits		( ) ____				(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ____	+2			(aw)
53 or 53A	SCT (Offset 25°)			Reacted as Specified				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (ar) is -, add calibration chart indication to 0°0'.
If line (ar) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 9 OF 11

JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
54 or 54A	SCT Comparision (Offset 0°)			Reacted as Specified				
60	Image resolution		clear and distinct					
63	Image resolution		clear and distinct					
65 or 65A	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ____	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ____	+00002			(b)
68	VDW Reading of WLLOS*	deg min		____ ____				(c)
69	Convert line (c) to sec using Calibration chart*	sec		( ) ____				(d)
	VDW Reading of WSTLOS*	deg min		____ ____				(e)
	Convert line (e) to sec using calibration chart*	sec		( ) ____				(f)

*VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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EQUIPMENT TEST
DATA SHEET 10 OF 11

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
74, 75	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ____		

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EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
79	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
	Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
	Δ16 - 90° 00' 00"		
80	ΣΔ(72) = ΣΔ(67, 68) = - ____ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST

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INITIAL TDRR 29882 D.S. PGS 11

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION SXT LOS parallelism and SXT St LOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-
L	9-28-67	34741	1,2,3,6,7,8	1,9	EA	-
M	10-26-67	34934	3	7	EA	-
N	3-19-68	35891	1,3	1-8,11	EA	-
P	5-2-68	36154	1,2,5,8	-	EA	-
R	10-21-68	36929	1	-	EA	-
S	12-10-68	37113	2,3,8,9	All	EA	-
T	12-27-68	37153	2	-	EA JF	-
U	1-28-69	37272	-	1, 9	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 1. Insure that JDC 19128 has been performed within the last six months.
2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.
3. If a Fresh Start (VERB 36 ENTR) is performed at any time during performance of this JDC, set OPTICS ZERO switch (Indicator Control panel 2021290) to OFF and then to ON and wait 18 seconds before proceeding; or set OPTICS MODE switch (all Indicator Control panels except 2021290) to MAN and then to ZERO and wait 18 seconds before proceeding.

NOTE: 1. Perform JDC 12215 to establish a Master Initialization condition. Place the G & N Mounting Fixture in the 0.0° position immediately after the IMU is coarse aligned to zero degree. 2. Step 1 applies to Indicator Control panel 2021290 only. Step 1A applies to all Indicator Control panels except 2021290.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FCR 4 0143A
Chg. 3-8-66

JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV U PAGE 2 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

1. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS ZERO switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

1A. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and that OPTICS TRACKER switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Set OPTICS COUPLING switch to DIRECT and set OPTICS SPEED switch to HI.

2A. Set OPTICS CONTROLLER COUPLING switch to DIRECT and set OPTICS CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control panel to MAN.

NOTE: Step 4 applies to Indicator Control panel 2021290 only. Step 4A applies to all Indicator Control panels except 2021290.

4. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, return OPTICS ZERO switch to OFF.

4A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, return OPTICS MODE switch to MAN.

5. through 7. Deleted

8. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G&N Mounting Fixture until the single vertical reticle line is adjacent to the dot of target number 1.

9. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the horizontal plane (setting knob points right). Set the VDW dial to zero.

NOTE: Step 10 applies to Indicator Control panel 2021290 only. Step 10A applies to all Indicator Control panels except 2021290.

10. Set OPTICS MODE switch to CMC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR

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SUBSYSTEM G & N SYSTEM | ASSY

b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

10A. Set OPTICS MODE switch on Indicator Control panel to CGC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

11. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g. 1). Complete line (g. 2). Uncover the SXT StLOS.

12. Complete lines (h), (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to LO.

15A. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS CONTROLLER SPEED switch to LO.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (1) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (1) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

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SUBSYSTEM G & N SYSTEM | ASSY

22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

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40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

49A. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 50 applies to Indicator Control panel 2021290 only. Step 50A applies to all Indicator Control panels except 2021290.

50. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

50A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 51 applies to Indicator Control panel 2021290 only. Step 51A applies to all Indicator Control panels except 2021290.

51. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

51A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

NOTE: Step 53 applies to Indicator Control panel 2021290 only. Step 53A applies to all Indicator Control panels except 2021290.

53. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS TEL TRUN switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

53A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

NOTE: Step 54 applies to Indicator Control panel 2021290 only. Step 54A applies to all Indicator Control panels except 2021290.

54. Set OPTICS TEL TRUN switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

54A. Set OPTICS TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

NOTE: Step 55 applies to Indicator Control panel 2021290 only. Step 55A applies to all Indicator Control panels except 2021290.

55. Set OPTICS TEL TRUN switch to SLAVE TO SXT.

55A. Set OPTICS TELESCOPE TRUNNION switch to SLAVE TO SXT.

NOTE: Step 56 applies to Indicator Control panel 2021290. Step 56A applies to all Indicator Control panels except 2021290.

56. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

56A. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 57 applies to Indicator Control panel 2021290 only. Step 57A applies to all Indicator Control panels except 2021290.

57. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

57A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 65 applies to Indicator Control panel 2021290 only. Step 65A applies to all Indicator Control panels except 2021290.

65. Set OPTICS ZERO switch to ZERO. After one minute, perform following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

65A. Set OPTICS MODE switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

66. Place the VDW in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

67. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

NOTE: If coincidence cannot be achieved in step 67 by adjusting the G & N Mounting Fixture, target number 1 may be adjusted in azimuth as necessary to achieve coincidence.

68. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 69 is not within tolerance, perform the alternate procedure given in steps 72 through 80 to verify that an out-of-tolerance condition exists.

69. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

NOTE: Step 70 applies to Indicator Control panel 2021290 only. Step 70A applies to all Indicator Control panels except 2021290.

70. Set OPTICS ZERO switch on Indicator Control panel to OFF.

70A. Set OPTICS MODE switch on Indicator Control panel to MAN.

71. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

ALTERNATE SXT LOS PARALLELISM PROCEDURE

72. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV U PAGE 9 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

73. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90 . Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

74. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

75. Reverse and plunge the theodolite telescope and repeat step 74.

76. Repeat steps 74 and 75 for seven additional pairs of readings. After each time that step 75 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

77. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

78. Repeat step 73.

79. Repeat steps 74, 75, and 76.

80. Complete calculations for SXT StLOS to LLOS parallelism error.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV U
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
11	VDW Reading of WLLOS*	deg min						(g.1)
	Convert line (g.1) to sec using Calibration chart*	sec		( )				(g.2)
12	Transfer target calibration angle ϕ_3 from JDC 12223 Item C.1 to nearest whole second	deg min sec						(h)
	Calculate: 45° - line (h) to nearest second	sec		( )				(i)
	Calculate: Line (i) + line (g.2)	sec		( )				(j)
	Convert line (j) to VDW reading using calibration chart**	deg min						(k)

*VDW reading decreasing from 360° indicates (+) angle (seconds).
VDW reading increasing from 0° indicates (-) angle (seconds).
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits		— — . — — —				(l)
		Row 2 deg bits		— — . — — —				
		Row 2 deg bits		— — . — — —				
18	Select bit count 45°	bits	16382		16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( )				(n)
	Convert Line (n) to VDW reading using calibration chart**	deg min						(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		— — . — — —				(p)
		Row 2 deg bits		— — . — — —				
		Row 2 deg bits		— — . — — —				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (n) is -, add calibration chart indication to 0°0'.
If line (n) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV. U

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( )				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( )	+2			(s)
	Calculate: Line (j) +30 sec	sec		( )				(t)
	Convert Line (t) to VDW reading using calibration chart**	deg min						(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits		— — . — — —				(v)
		Row 2 deg bits		— — . — — —				
		Row 2 deg bits		— — . — — —				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (t) is -, add calibration chart indication to 0°0'.
If line (t) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. U

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits	▨	______	▨	▨	▨	(w)
29	Calculate: Line (m) +00003 bits	bits	▨	( ) ______	▨	▨	▨	(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ______	+2			(y)
	Calculate: Line (j) +60 sec	sec	▨	( ) ______	▨	▨	▨	(z)
	Convert Line (z) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(aa)
32	Record CMC NAV DSKY Row 2 display * 45° (+60")	Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	(ab)
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	
33	Select bit count 45° (+60")	bits	▨	______	▨	▨	▨	(ac)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (z) is -, add calibration chart indication to 0°0'.
If line (z) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 5 OF 11

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits	▨	( ) ______	▨	▨	▨	(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (+60")	bits	-2	( ) ______	+2			(ae)
	Calculate: Line (j) - 30 sec	sec	▨	( ) ______	▨	▨	▨	(af)
	Convert Line (af) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(ag)
37	Record CMC NAV DSKY Row 2 display * 45° (-30")	Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	(ah)
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	
38	Select bit count 45° (-30")	bits	▨	______	▨	▨	▨	(ai)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (af) is -, add calibration chart indication to 0°0'.
If line (af) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 6 OF 11

JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
39	Calculate: Line (m) -00003 bits	bits	▨	( ) ______	▨	▨	▨	(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ______	+2			(ak)
	Calculate: Line (j) -90 sec	sec	▨	( ) ______	▨	▨	▨	(al)
	Convert Line (al) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(am)
42	Record CMC NAV DSKY Row 2 display * 45° (-90")	Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	(an)
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (al) is -, add calibration chart indication to 0°0'.
If line (al) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 7 OF 11

JDC
NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
43	Select bit count 45° (-90")	bits	▨	______	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( ) ______	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ______	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( ) ______	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart**	deg min	▨	______ ______	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display * 45° (-60")	Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	(at)
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	
		Row 2 deg bits	▨	__ __ . __ __ __ ______	▨	▨	▨	

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (ar) is -, add calibration chart indication to 0°0'.
If line (ar) is +, subtract calibration chart indication from 359°60'.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
48	Select bit count 45° (-60)')	bits	▨	________	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( )________	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( )________	+2			(aw)
53 or 53A	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54 or 54A	SCT Comparison (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			
65 or 65A	DSKY Row 2 display (Trunnion angle)	deg	-00007	( )________	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( )________	+00002			(b)
68	VDW Reading of WLLOS*	deg min	▨	________ ________	▨			(c)

*VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
69	Convert line (c) to sec using Calibration chart*	sec	▨	( )________	▨			(d)
	VDW Reading of WSTLOS*	deg min	▨	________ ________	▨			(e)
	Convert line (e) to sec using calibration chart*	sec	▨	( )________	▨			(f)
	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	sec	-10	( )	+10			(g)

*VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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EQUIPMENT TEST
DATA SHEET 10 **OF** 11

JDC NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES
74, 75	Δ1 - 90° 00' 00.0" Δ2 - 270° 00' 00.0" Δ3 - 270° 00' 00.0" Δ4 - 90° 00' 00.0" Δ5 - 90° 00' 00.0" Δ6 - 270° 00' 00.0" Δ7 - 270° 00' 00.0" Δ8 - 90° 00' 00.0" Δ9 - 90° 00' 00.0" Δ10 - 270° 00' 00.0" Δ11 - 270° 00' 00.0" Δ12 - 90° 00' 00.0" Δ13 - 90° 00' 00.0" Δ14 - 270° 00' 00.0" Δ15 - 270° 00' 00.0" Δ16 - 90° 00' 00.0" $\frac{\Sigma\Delta}{16}$ = ________

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EQUIPMENT TEST
DATA SHEET 11 **OF** 11

JDC NO. 12214
REV. U

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES
79	Δ1 - 90° 00' 00.0" Δ2 - 270° 00' 00.0" Δ3 - 270° 00' 00.0" Δ4 - 90° 00' 00.0" Δ5 - 90° 00' 00.0" Δ6 - 270° 00' 00.0" Δ7 - 270° 00' 00.0" Δ8 - 90° 00' 00.0" Δ9 - 90° 00' 00.0" Δ10 - 270° 00' 00.0" Δ11 - 270° 00' 00.0" Δ12 - 90° 00' 00.0" Δ13 - 90° 00' 00.0" Δ14 - 270° 00' 00.0" Δ15 - 270° 00' 00.0" Δ16 - 90° 00' 00"
80	ΣΔ(72) = ΣΔ(67, 68) = -________ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC 12214 **REV.** V **PAGE** 1 **OF** 9
INITIAL TDRR 29882 **D.S. PGS.** 11

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION SXT LOS parallelism and SXT St LOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-
L	9-28-67	34741	1,2,3,6,7,8	1,9	EA	-
M	10-26-67	34934	3	7	EA	-
N	3-19-68	35891	1,3	1-8,11	EA	-
P	5-2-68	36154	1,2,5,8	-	EA	-
R	10-21-68	36929	1	-	EA	-
S	12-10-68	37113	2,3,8,9	All	EA	-
T	12-27-68	37153	2	-	EA JF	-
U	1-28-69	37272	-	1, 9	EA	-
V	3-11-69	37405	2	-	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 1. Insure that JDC 19128 has been performed within the last six months.
2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.
3. If a Fresh Start (VERB 36 ENTR) is performed at any time during performance of this JDC, set OPTICS ZERO switch (Indicator Control panel 2021290) to OFF and then to ON and wait 18 seconds before proceeding; or set OPTICS MODE switch (all Indicator Control panels except 2021290) to MAN and then to ZERO and wait 18 seconds before proceeding.

NOTE: 1. Perform JDC 12215 to establish a Master Initialization condition. Place the G & N Mounting Fixture in the 0.0° position immediately after the IMU is coarse aligned to zero degree. 2. Step 1 applies to Indicator Control panel 2021290 only. Step 1A applies to all Indicator Control panels except 2021290.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FCR 1.0-143A
Chg. 3-18-66

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1. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS ZERO switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

1A. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and that OPTICS TRACKER switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Set OPTICS COUPLING switch to DIRECT and set OPTICS SPEED switch to HI.

2A. Set OPTICS CONTROLLER COUPLING switch to DIRECT and set OPTICS CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control panel to MAN.

NOTE: Step 4 applies to Indicator Control panel 2021290 only. Step 4A applies to all Indicator Control panels except 2021290.

4. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, return OPTICS ZERO switch to OFF.

4A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, return OPTICS MODE switch to MAN.

5. through 7. Deleted

8. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G&N Mounting Fixture until the dot of target number 1 is horizontally adjacent to the double vertical lines of the SXT reticle.

9. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the horizontal plane (setting knob points right). Set the VDW dial to zero.

NOTE: Step 10 applies to Indicator Control panel 2021290 only. Step 10A applies to all Indicator Control panels except 2021290.

10. Set OPTICS MODE switch to CMC and perform the following DSKY operations:
a. VERB 41 NOUN 55 ENTR

---

b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

10A. Set OPTICS MODE switch on Indicator Control panel to CGC and perform the following DSKY operations:
a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

11. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g.1). Complete line (g.2). Uncover the SXT StLOS.

12. Complete lines (h), (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to LO.

15A. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS CONTROLLER SPEED switch to LO.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (1) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (1) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

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22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

49A. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 50 applies to Indicator Control panel 2021290 only. Step 50A applies to all Indicator Control panels except 2021290.

50. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

50A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 51 applies to Indicator Control panel 2021290 only. Step 51A applies to all Indicator Control panels except 2021290.

51. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

51A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

NOTE: Step 53 applies to Indicator Control panel 2021290 only. Step 53A applies to all Indicator Control panels except 2021290.

53. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS TEL TRUN switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

53A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

NOTE: Step 54 applies to Indicator Control panel 2021290 only. Step 54A applies to all Indicator Control panels except 2021290.

54. Set OPTICS TEL TRUN switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

54A. Set OPTICS TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

NOTE: Step 55 applies to Indicator Control panel 2021290 only. Step 55A applies to all Indicator Control panels except 2021290.

55. Set OPTICS TEL TRUN switch to SLAVE TO SXT.

55A. Set OPTICS TELESCOPE TRUNNION switch to SLAVE TO SXT.

NOTE: Step 56 applies to Indicator Control panel 2021290. Step 56A applies to all Indicator Control panels except 2021290.

56. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

56A. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 57 applies to Indicator Control panel 2021290 only. Step 57A applies to all Indicator Control panels except 2021290.

57. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

57A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 65 applies to Indicator Control panel 2021290 only. Step 65A applies to all Indicator Control panels except 2021290.

65. Set OPTICS ZERO switch to ZERO. After one minute, perform following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

65A. Set OPTICS MODE switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

66. Place the VDW in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

67. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

NOTE: If coincidence cannot be achieved in step 67 by adjusting the G & N Mounting Fixture, target number 1 may be adjusted in azimuth as necessary to achieve coincidence.

68. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 69 is not within tolerance, perform the alternate procedure given in steps 72 through 80 to verify that an out-of-tolerance condition exists.

69. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

NOTE: Step 70 applies to Indicator Control panel 2021290 only. Step 70A applies to all Indicator Control panels except 2021290.

70. Set OPTICS ZERO switch on Indicator Control panel to OFF.

70A. Set OPTICS MODE switch on Indicator Control panel to MAN.

71. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

ALTERNATE SXT LOS PARALLELISM PROCEDURE

72. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

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SUBSYSTEM G & N SYSTEM | ASSY

73. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

74. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

75. Reverse and plunge the theodolite telescope and repeat step 74.

76. Repeat steps 74 and 75 for seven additional pairs of readings. After each time that step 75 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

77. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

78. Repeat step 73.

79. Repeat steps 74, 75, and 76.

80. Complete calculations for SXT StLOS to LLOS parallelism error.

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EQUIPMENT TEST
DATA SHEET 1 OF 11

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JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE

NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
11	VDW Reading of WLLOS*	deg min		______ ______				(g. 1)
	Convert line (g. 1) to sec using Calibration chart*	sec		( ) ______				(g. 2)
12	Transfer target calibration angle ϕ_3 from JDC 12223 Item C. 1 to nearest whole second	deg min sec		______ ______ ______				(h)
	Calculate: 45° - line (h) to nearest second	sec		( ) ______				(i)
	Calculate: Line (i) + line (g. 2)	sec		( ) ______				(j)
	Convert line (j) to VDW reading using calibration chart**	deg min		______ ______				(k)

*VDW reading decreasing from 360° indicates (+) angle (seconds).
VDW reading increasing from 0° indicates (-) angle (seconds).
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits		— — · — — — ______				(l)
		Row 2 deg bits		— — · — — — ______				
		Row 2 deg bits		— — · — — — ______				
18	Select bit count 45°	bits	16382	______	16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( ) ______				(n)
	Convert Line (n) to VDW reading using calibration chart**	deg min		______ ______				(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		— — · — — — ______				(p)
		Row 2 deg bits		— — · — — — ______				
		Row 2 deg bits		— — · — — — ______				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (n) is -, add calibration chart indication to 0°0'.
If line (n) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ______				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ______	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ______				(t)
	Convert Line (t) to VDW reading using calibration chart**	deg min		______ ______				(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits		— — · — — — ______				(v)
		Row 2 deg bits		— — · — — — ______				
		Row 2 deg bits		— — · — — — ______				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (t) is -, add calibration chart indication to 0°0'.
If line (t) is +, subtract calibration chart indication from 359°60'.

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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		____				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) ____				(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ____	+2			(y)
	Calculate: Line (j) +60 sec	sec		( ) ____				(z)
	Convert Line (z) to VDW reading using calibration chart**	deg min		____ ____				(aa)
32	Record CMC NAV DSKY Row 2 display * 45° (+60")	Row 2 deg bits		___ . ____ ____				(ab)
		Row 2 deg bits		___ . ____ ____				
		Row 2 deg bits		___ . ____ ____				
33	Select bit count 45° (+60")	bits		____				(ac)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (z) is -, add calibration chart indication to 0°0'.
If line (z) is +, subtract calibration chart indication from 359°60'.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) ____				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (+60")	bits	-2	( ) ____	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) ____				(af)
	Convert Line (af) to VDW reading using calibration chart**	deg min		____ ____				(ag)
37	Record CMC NAV DSKY Row 2 display * 45° (-30")	Row 2 deg bits		___ . ____ ____				(ah)
		Row 2 deg bits		___ . ____ ____				
		Row 2 deg bits		___ . ____ ____				
38	Select bit count 45° (-30")	bits		____				(ai)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (af) is -, add calibration chart indication to 0°0'.
If line (af) is +, subtract calibration chart indication from 359°60'.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
39	Calculate: Line (m) -00003 bits	bits		( ) ____				(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ____	+2			(ak)
	Calculate: Line (j) -90 sec	sec		( ) ____				(al)
	Convert Line (al) to VDW reading using calibration chart**	deg min		____ ____				(am)
42	Record CMC NAV DSKY Row 2 display * 45° (-90")	Row 2 deg bits		___ . ____ ____				(an)
		Row 2 deg bits		___ . ____ ____				
		Row 2 deg bits		___ . ____ ____				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (al) is -, add calibration chart indication to 0°0'.
If line (al) is +, subtract calibration chart indication from 359°60'.

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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
43	Select bit count 45° (-90")	bits		____				(ao)
44	Calculate: Line (m) -00009 bits	bits		( ) ____				(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ____	+2			(aq)
	Calculate: Line (j) -60 sec	sec		( ) ____				(ar)
	Convert Line (ar) to VDW reading using calibration chart**	deg min		____ ____				(as)
47	Record CMC NAV DSKY Row 2 display * 45° (-60")	Row 2 deg bits		___ . ____ ____				(at)
		Row 2 deg bits		___ . ____ ____				
		Row 2 deg bits		___ . ____ ____				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (ar) is -, add calibration chart indication to 0°0'.
If line (ar) is +, subtract calibration chart indication from 359°60'.

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
48	Select bit count 45° (-60')')	bits		______				(au)
49	Calculate: Line (m) -00006 bits	bits		( ) ______				(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( ) ______	+2			(aw)
53 or 53A	SCT (Offset 25°)			Reacted as Specified				
54 or 54A	SCT Comparison (Offset 0°)			Reacted as Specified				
60	Image resolution		clear and distinct					
63	Image resolution		clear and distinct					
65 or 65A	DSKY Row 2 display (Trunnion angle)	deg	-00007	( ) ______	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ______	+00002			(b)
68	VDW Reading of WLLOS*	deg min		______ ______				(c)

*VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
69	Convert line (c) to sec using Calibration chart*	sec		( ) ______				(d)
	VDW Reading of WSTLOS*	deg min		______ ______				(e)
	Convert line (e) to sec using calibration chart*	sec		( ) ______				(f)
	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	sec	-10	( )	+10			(g)

*VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
74, 75	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0" ______	Δ3 - 270° 00' 00.0" ______
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0" ______
	Δ7 - 270° 00' 00.0" ______	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0" ______	Δ11 - 270° 00' 00.0" ______	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0" ______	Δ15 - 270° 00' 00.0" ______
	Δ16 - 90° 00' 00.0"		
	$\frac{\Sigma\Delta}{16}$ = ______		

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JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	RECORDED VALUES		
79	Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0" ______	Δ3 - 270° 00' 00.0" ______
	Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0" ______
	Δ7 - 270° 00' 00.0" ______	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
	Δ10 - 270° 00' 00.0" ______	Δ11 - 270° 00' 00.0" ______	Δ12 - 90° 00' 00.0"
	Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0" ______	Δ15 - 270° 00' 00.0" ______
	Δ16 - 90° 00' 00"		
80	$\Sigma\Delta$(72) = $\Sigma\Delta$(67, 68) = -______ StLOS/LLOS Parallelism Tolerance: -10 minimum, +10 maximum		

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JOB OPTICS POSITIONAL ACCURACY TEST

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION SXT LOS parallelism and SXT St LOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30306	2,4,5	2,3,5	EA	WS
B	9-1-66	30925	5	-	JP	-
C	9-15-66	31055	1,2,5,6	2,9,10	EA	-
D	11-10-66	31892	1,3,4,5	-	EA	-
E	1-19-67	32692	1,2,3,5	1,2,11	EA	-
F	2-2-67	32884	1,2,3,4,5	-	EA	-
G	3-2-67	33107	-	2	EA	-
H	5-4-67	33720	-	11	EA	-
J	7-27-67	34237	1	-	EA	
K	9-6-67	34560	1	-	EA	-
L	9-28-67	34741	1,2,3,6,7,8	1,9	EA	-
M	10-26-67	34934	3	7	EA	-
N	3-19-68	35891	1,3	1-8,11	EA	-
P	5-2-68	36154	1,2,5,8	-	EA	-
R	10-21-68	36929	1	-	EA	-
S	12-10-68	37113	2,3,8,9	All	EA	-
T	12-27-68	37153	2	-	EA JF	-
U	1-28-69	37272	-	1, 9	EA	-
V	3-11-69	37405	2	-	EA	-
W	5-26-70	38125	1, 8	-	EA	-

REFERENCES PS 2015000
JDC 19128

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

IMPORTANT: 1. Insure that JDC 19128 has been performed within the last six months.
2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.
3. If a Fresh Start (VERB 36 ENTR) is performed at any time during performance of this JDC, set OPTICS ZERO switch (Indicator Control panel 2021290) to OFF and then to ON and wait 18 seconds before proceeding; or set OPTICS MODE switch (all Indicator Control panels except 2021290) to MAN and then to ZERO and wait 18 seconds before proceeding.

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike cradle locking handles.

NOTE: 1. Perform JDC 12215 to establish a Master Initialization condition. Place the G & N Mounting Fixture in the 0.0° position immediately after the IMU is coarse aligned to zero

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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degree. 2. Step 1 applies to Indicator Control panel 2021290 only. Step 1A applies to all Indicator Control panels except 2021290.

1. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TEL TRUN switch on Indicator Control panel is set to SLAVE TO SXT and the OPTICS ZERO switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

1A. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall light. Insure that OPTICS TELESCOPE TRUNNION switch on Indicator Control panel is set to SLAVE TO SXT and that OPTICS TRACKER switch is set to OFF. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel of CTS to reset alarms which may occur.

NOTE: Step 2 applies to Indicator Control panel 2021290 only. Step 2A applies to all Indicator Control panels except 2021290.

2. Set OPTICS COUPLING switch to DIRECT and set OPTICS SPEED switch to HI.

2A. Set OPTICS CONTROLLER COUPLING switch to DIRECT and set OPTICS CONTROLLER SPEED switch to HI.

3. Place OPTICS MODE switch on the Indicator Control panel to MAN.

NOTE: Step 4 applies to Indicator Control panel 2021290 only. Step 4A applies to all Indicator Control panels except 2021290.

4. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, return OPTICS ZERO switch to OFF.

4A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, return OPTICS MODE switch to MAN.

5. through 7. Deleted

8. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G&N Mounting Fixture until the dot of target number 1 is horizontally adjacent to the double vertical lines of the SXT reticle.

9. Place the Variable Deviation Wedge (VDW) in front of target number 1 using the VDW base which allows deviation to be measured in the horizontal plane (setting knob points right). Set the VDW dial to zero.

NOTE: Step 10 applies to Indicator Control panel 2021290 only. Step 10A applies to all Indicator Control panels except 2021290.

10. Set OPTICS MODE switch to CMC and perform the following DSKY operations:

---

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

10A. Set OPTICS MODE switch on Indicator Control panel to CGC and perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

Wait until optics stop driving before proceeding.

11. Sight through the SXT LLOS and move the VDW laterally until the target number 1 reticle is seen clearly. Adjust the VDW dial until the central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the VDW dial reading on line (g. 1). Complete line (g. 2). Uncover the SXT StLOS.

12. Complete lines (h), (i), (j), and (k) on the Data Sheet.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

NOTE: Step 15 applies to Indicator Control panel 2021290 only. Step 15A applies to all Indicator Control panels except 2021290.

15. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to LO.

15A. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS CONTROLLER SPEED switch to LO.

16. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (o).

21. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

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22. Record the DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics Hand Controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

49A. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 50 applies to Indicator Control panel 2021290 only. Step 50A applies to all Indicator Control panels except 2021290.

50. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

50A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 51 applies to Indicator Control panel 2021290 only. Step 51A applies to all Indicator Control panels except 2021290.

51. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

51A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Return OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so Shaft TPAC indicates +27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

NOTE: Step 53 applies to Indicator Control panel 2021290 only. Step 53A applies to all Indicator Control panels except 2021290.

53. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS TEL TRUN switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

53A. Set OPTICS MODE switch on Indicator Control panel to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN. Set OPTICS TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

NOTE: Step 54 applies to Indicator Control panel 2021290 only. Step 54A applies to all Indicator Control panels except 2021290.

54. Set OPTICS TEL TRUN switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

54A. Set OPTICS TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

NOTE: Step 55 applies to Indicator Control panel 2021290 only. Step 55A applies to all Indicator Control panels except 2021290.

55. Set OPTICS TEL TRUN switch to SLAVE TO SXT.

55A. Set OPTICS TELESCOPE TRUNNION switch to SLAVE TO SXT.

NOTE: Step 56 applies to Indicator Control panel 2021290. Step 56A applies to all Indicator Control panels except 2021290.

56. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

56A. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

NOTE: Step 57 applies to Indicator Control panel 2021290 only. Step 57A applies to all Indicator Control panels except 2021290.

57. Set OPTICS SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

57A. Set OPTICS CONTROLLER SPEED switch to HI and, using Optics Hand Controller, drive SXT until Shaft TPAC indicates approximately +27000. Set OPTICS CONTROLLER SPEED switch to LO and manipulate Optics Hand Controller to fine position and hold SXT so that Shaft TPAC indicates +27000.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics Hand Controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines of target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics Hand Controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 65 applies to Indicator Control panel 2021290 only. Step 65A applies to all Indicator Control panels except 2021290.

65. Set OPTICS ZERO switch to ZERO. After one minute, perform following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

65A. Set OPTICS MODE switch to ZERO. After one minute, perform the following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

66. Place the VDW in front of target number 1 using the VDW base which allows deviation to be measured in the vertical plane (setting knob points upward). Set VDW dial to zero.

67. Cover the SXT StLOS. Sight through the SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

NOTE: If coincidence cannot be achieved in step 67 by adjusting the G & N Mounting Fixture, target number 1 may be adjusted in azimuth as necessary to achieve coincidence.

68. Sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until the central horizontal reticle line of SXT is coincident with dot and horizontal reticle line of target number 1. Record the VDW reading on line (c). Uncover the SXT StLOS.

NOTE: If the value obtained for line (g) in step 69 is not within tolerance, perform the alternate procedure given in steps 72 through 80 to verify that an out-of-tolerance condition exists.

69. Cover the SXT LLOS. Sight through the SXT StLOS and adjust the VDW dial until the central horizontal reticle line of SXT is coincident with the dot and horizontal reticle line of target number 1. Record the VDW reading on line (e). Complete lines (d), (f), and (g). Uncover SXT LLOS.

NOTE: Step 70 applies to Indicator Control panel 2021290 only. Step 70A applies to all Indicator Control panels except 2021290.

70. Set OPTICS ZERO switch on Indicator Control panel to OFF.

70A. Set OPTICS MODE switch on Indicator Control panel to MAN.

70B. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

71. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON pushbutton shall go out.

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SUBSYSTEM G & N SYSTEM | ASSY

ALTERNATE SXT LOS PARALLELISM PROCEDURE

72. Place the theodolite in a line coincident with the SXT LLOS and cover the SXT StLOS.

73. Level theodolite base to the plate spirit level and level the altitude spirit level. Adjust the telescope focus to infinity. Set telescope to approximately 90°. Install the portable light assembly and adapter in the SXT eyepiece assembly. While observing the theodolite image, adjust the G & N Mounting Fixture until the SXT reticle is superimposed on the theodolite horizontal filar.

74. Align the theodolite horizontal filar to the SXT reticle and record the vertical angle.

75. Reverse and plunge the theodolite telescope and repeat step 74.

76. Repeat steps 74 and 75 for seven additional pairs of readings. After each time that step 75 is completed, drive the theodolite elevation off prior to realigning to the SXT reticle.

77. Place the theodolite in a line coincident with the SXT StLOS and cover the SXT LLOS.

78. Repeat step 73.

79. Repeat steps 74, 75, and 76.

80. Complete calculations for SXT StLOS to LLOS parallelism error.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 11

JDC
NO. 12214
REV W
INITIAL TDRR 29882

JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE

NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
11	VDW Reading of WLLOS*	deg min		____ ____				(g. 1)
	Convert line (g. 1) to sec using Calibration chart*	sec		( ) ____				(g. 2)
12	Transfer target calibration angle ϕ_3 from JDC 12223 Item C. 1 to nearest whole second	deg min sec		____ ____ ____				(h)
	Calculate: 45° - line (h) to nearest second	sec		( ) ____				(i)
	Calculate: Line (i) + line (g. 2)	sec		( ) ____				(j)
	Convert line (j) to VDW reading using calibration chart**	deg min		____ ____				(k)

*VDW reading decreasing from 360° indicates (+) angle (seconds).
VDW reading increasing from 0° indicates (-) angle (seconds).
**If line (j) is -, add calibration chart indication to 0°0'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 11

JDC
NO. 12214
REV W

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits		— — . — — — ____				(l)
		Row 2 deg bits		— — . — — — ____				
		Row 2 deg bits		— — . — — — ____				
18	Select bit count 45°	bits	16382	____	16386			(m)
19	Calculate: Line (j) + 90 sec	sec		( ) ____				(n)
	Convert Line (n) to VDW reading using calibration chart**	deg min		____ ____				(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits		— — . — — — ____				(p)
		Row 2 deg bits		— — . — — — ____				
		Row 2 deg bits		— — . — — — ____				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (n) is -, add calibration chart indication to 0°0'.
If line (n) is +, subtract calibration chart indication from 359°60'.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 11

JDC
NO. 12214
REV W

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ____				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ____	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ____				(t)
	Convert Line (t) to VDW reading using calibration chart**	deg min		____ ____				(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits		— — . — — — ____				(v)
		Row 2 deg bits		— — . — — — ____				
		Row 2 deg bits		— — . — — — ____				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (t) is -, add calibration chart indication to 0°0'.
If line (t) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 4 OF 11

JDC
NO. 12214
REV. W

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		________				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) ________				(x)
	Calculate: Line (w) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ________	+2			(y)
	Calculate: Line (j) +60 sec	sec		( ) ________				(z)
	Convert Line (z) to VDW reading using calibration chart**	deg min		________ ________				(aa)
32	Record CMC NAV DSKY Row 2 display * 45° (+60")	Row 2 deg bits		— — . — — — — ________				(ab)
		Row 2 deg bits		— — . — — — — ________				
		Row 2 deg bits		— — . — — — — ________				
33	Select bit count 45° (+60")	bits		________				(ac)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (z) is -, add calibration chart indication to 0°0'.
If line (z) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 5 OF 11

JDC
NO. 12214
REV. W

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) ________				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (+60")	bits	-2	( ) ________	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) ________				(af)
	Convert Line (af) to VDW reading using calibration chart**	deg min		________ ________				(ag)
37	Record CMC NAV DSKY Row 2 display * 45° (-30")	Row 2 deg bits		— — . — — — — ________				(ah)
		Row 2 deg bits		— — . — — — — ________				
		Row 2 deg bits		— — . — — — — ________				
38	Select bit count 45° (-30")	bits		________				(ai)

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (af) is -, add calibration chart indication to 0°0'.
If line (af) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 6 OF 11

JDC
NO. 12214
REV. W

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
39	Calculate: Line (m) -00003 bits	bits		( ) ________				(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ________	+2			(ak)
	Calculate: Line (j) -90 sec	sec		( ) ________				(al)
	Convert Line (al) to VDW reading using calibration chart**	deg min		________ ________				(am)
42	Record CMC NAV DSKY Row 2 display * 45° (-90")	Row 2 deg bits		— — . — — — — ________				(an)
		Row 2 deg bits		— — . — — — — ________				
		Row 2 deg bits		— — . — — — — ________				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (al) is -, add calibration chart indication to 0°0'.
If line (al) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 7 OF 11

JDC
NO. 12214
REV. W

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
43	Select bit count 45° (-90")	bits		________				(ao)
44	Calculate: Line (m) -00009 bits	bits		( ) ________				(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( ) ________	+2			(aq)
	Calculate: Line (j) -60 sec	sec		( ) ________				(ar)
	Convert Line (ar) to VDW reading using calibration chart**	deg min		________ ________				(as)
47	Record CMC NAV DSKY Row 2 display * 45° (-60")	Row 2 deg bits		— — . — — — — ________				(at)
		Row 2 deg bits		— — . — — — — ________				
		Row 2 deg bits		— — . — — — — ________				

*Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
**If line (ar) is -, add calibration chart indication to 0°0'.
If line (ar) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 8 OF 11

JDC
NO. 12214
REV. W

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
48	Select bit count 45° (-60)')	bits	▨	________	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( )________	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( )________	+2			(aw)
53 or 53A	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54 or 54A	SCT Comparison (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			
65 or 65A	DSKY Row 2 display (Trunnion angle)	deg	-00007	( )________	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( )________	+00002			(b)
68	VDW Reading of WLLOS*	deg min	▨	________ ________	▨			(c)

*VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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FORM 0 147

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 11

JDC
NO. 12214
REV. W

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
69	Convert line (c) to sec using Calibration chart*	sec	▨	( )________	▨			(d)
	VDW Reading of WSTLOS*	deg min	▨	________ ________	▨			(e)
	Convert line (e) to sec using calibration chart*	sec	▨	( )________	▨			(f)
	Calculate: Line (f) - Line (d) - Vertical Error from JDC 19128, step B.19. StLOS-LLOS parallelism	sec	-10	( )	+10			(g)

*VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 11

JDC
NO. 12214
REV. W

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.: 74, 75

RECORDED VALUES

Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
Δ16 - 90° 00' 00.0"		

$\frac{\Sigma\Delta}{16}$ = ________

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FORM 00145

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 OF 11

JDC
NO. 12214
REV. W

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.: 79

RECORDED VALUES

Δ1 - 90° 00' 00.0"	Δ2 - 270° 00' 00.0"	Δ3 - 270° 00' 00.0"
Δ4 - 90° 00' 00.0"	Δ5 - 90° 00' 00.0"	Δ6 - 270° 00' 00.0"
Δ7 - 270° 00' 00.0"	Δ8 - 90° 00' 00.0"	Δ9 - 90° 00' 00.0"
Δ10 - 270° 00' 00.0"	Δ11 - 270° 00' 00.0"	Δ12 - 90° 00' 00.0"
Δ13 - 90° 00' 00.0"	Δ14 - 270° 00' 00.0"	Δ15 - 270° 00' 00.0"
Δ16 - 90° 00' 00"		

JDC ITEM NO.: 80

$\Sigma\Delta(72)$ =
$\Sigma\Delta(67, 68)$ = -________ StLOS/LLOS Parallelism

Tolerance: -10 minimum, +10 maximum

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JOB OPTICS POSITIONAL ACCURACY TEST

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INITIAL TDRR 29882 D.S. PGS 9

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION SXT LOS parallelism and SXT StLOS positional accuracy are checked in this test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Variable Deviation Wedge
SCT Resolution Card

NOTE: The G & N Mounting Fixture shall be set at the 0.0° position.

1. Insure that the TELESCOPE TRUNNION switch on the Indicator Control panel is set to SLAVE TO SXT and that the TRACKER switch is in the OFF position.

2. Set the CONTROLLER COUPLING switch to DIRECT and the CONTROLLER SPEED switch to HI.

3. Perform the following DSKY operations:

a. VERB 16 NOUN 55 ENTR

b. Observe SXT Shaft Angle Displayed on Row 1

c. Observe SXT TRN LOS Angle Displayed on Row 2

4. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After one minute, record the DSKY Row 1 (Shaft Angle) and Row 2 (Trunnion LOS Angle) indications on lines (a) and (b) of the Data Sheet.

5. Place the Variable Deviation Wedge (VDW) in front of target number 1 and set VDW dial to zero. Sight through SXT LLOS and adjust the G & N Mounting Fixture until the horizontal reticle line of the SXT is coincident with the dot and horizontal reticle line of target number 1.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Set the OPTICS MODE switch on the Indicator Control panel to MAN. Pushing the Optics hand controller to the left, drive the SXT until Row 1 of the DSKY indicates 27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates 27000 and Row 2 indicates the value recorded in step 4, line (a).

7. Cover the SXT StLOS and sight through the SXT LLOS and move the VDW laterally until target number 1 reticle is seen clearly. Adjust the VDW dial until central vertical reticle line of SXT is coincident with dot and vertical reticle line of target number 1. Record the dial reading of the VDW on line (c). Uncover StLOS.

8. Cover the SXT LLOS and repeat step 7 for the SXT StLOS while maintaining a DSKY Row 2 indication of step 4, line (a), and Row 1 indication of 27000 by manipulating the Optics hand controller. Record VDW reading on line (e). Complete lines (d), (f) and (g).

9. Set OPTICS MODE switch to ZERO. After the DSKY displays all zeroes on Row 1 and Row 2, set the OPTICS MODE switch to MAN.

10. Complete lines (i) (j) and (k) on the Data Sheet. Set the CONTROLLER SPEED switch to HI.

11. Repeat step 6.

12. Set the VDW to value recorded on line (c). Sight through the SXT eyepiece and viewing along the LLOS, insure that the SXT vertical reticle line and target number 1 reticle dot (or vertical reticle line) are coincident.

13. Place the VDW in front of target number 3 and cover target number 1.

14. Set the VDW to the value recorded on line (k).

15. Set the CONTROLLER SPEED switch on the Indicator Control panel to HI and using the Optics hand controller, drive the SXT until Row 2 of the DSKY indicates 45000. Return the CONTROLLER SPEED switch to LO.

16. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on reticle of target number 3 approaches the vertical crosshair on the SXT reticle. At the instant of coincidence, press the MARK pushbutton.

NOTE: VERB 06, NOUN 56 shall appear on the CMC DSKY indicating optical CDU and time displays.

17. Record the NAV DSKY Row 2 indication on line (l) of the Data Sheet. Repeat step 16 two more times, recording the DSKY Row 2 indication for each MARK.

18. Observe the three bit counts of line (l) of the Data Sheet. If two of the three counts

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are equal, record this count in line (m). If all three counts are different, record the count which falls between the smallest and the largest on line (m).

19. Complete lines (n) and (o) of the Data Sheet.

20. Set the VDW to the value recorded on line (n).

21. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 approaches the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

22. Record the NAV DSKY Row 2 indication on line (p) of the Data Sheet. Repeat step 21 two more times, recording the DSKY Row 2 indication for each MARK.

23. Observe the three bit counts of line (p). If two of the three counts are equal, record this count on line (q). If all three counts are different, record the count which falls between the smallest and the largest on line (q).

24. Complete lines (r), (s), (t) and (u).

25. Set the VDW to the value recorded on line (u).

26. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

27. Record the NAV DSKY Row 2 indication on line (v). Repeat step 26 two more times, recording the DSKY Row 2 indication for each MARK.

28. Observe the three bit counts of line (v). If two of the three counts are equal, record this count on line (w). If all three counts are different, record the count which falls between the smallest and the largest on line (w).

29. Complete lines (x), (y), (z) and (aa).

30. Set the VDW to the value recorded on line (aa).

31. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

32. Record the NAV DSKY Row 2 indication on line (ab). Repeat step 31 two more times, recording the DSKY Row 2 indication for each MARK.

33. Observe the three bit counts of line (ab). If two of the three counts are equal, record this count on line (ac). If all three counts are different, record the count which falls between the smallest and the largest on line (ac).

34. Complete lines (ad), (ae), (af) and (ag).

35. Set the VDW to the value recorded on line (ag).

36. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

37. Record the NAV DSKY Row 2 indication on line (ah). Repeat step 36 two more times, recording the DSKY Row 2 indication for each MARK.

38. Observe the three bit counts on line (ah). If two of the three counts are equal, record this count on line (ai). If all three counts are different, record the count which falls between the smallest and the largest on line (ai).

39. Complete lines (aj), (ak), (al) and (am).

40. Set the VDW to the value recorded on line (am).

41. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

42. Record the NAV DSKY Row 2 indication on line (an). Repeat step 41 two more times, recording the DSKY Row 2 indication for each MARK.

43. Observe the three bit counts on line (an). If two of the three counts are equal, record this count on line (ao). If all three counts are different, record the count which falls between the smallest and the largest on line (ao).

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44. Complete lines (ap), (aq), (ar) and (as).

45. Set the VDW to the value recorded on line (as).

46. Manipulate the Optics hand controller vertically to position the SXT StLOS until the central dot on the reticle of target number 3 is approaching the vertical crosshair on the SXT reticle. Press the MARK pushbutton at the instant of coincidence.

47. Record the NAV DSKY Row 2 indication on line (at). Repeat step 46 two more times, recording the DSKY Row 2 indication for each MARK.

48. Observe the three bit counts on line (at). If two of the three counts are equal, record this count on line (au). If all three counts are different, record the count which falls between the smallest and the largest on line (au).

49. Complete lines (av) and (aw).

50. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. After all zeroes are indicated on Row 1 and Row 2 of the DSKY, return the switch to MANUAL.

51. Set the CONTROLLER SPEED switch to HI, and using the Optics hand controller, drive the SXT until Row 1 of the DSKY indicates 27000. Return the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 indicates 27000.

52. Insure that the horizontal reticle line of the SCT is coincident with the

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JOB OPTICS POSITIONAL ACCURACY TEST | JDC 12214 REV - PAGE 5 OF 5

SUBSYSTEM G & N SYSTEM | ASSY

horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

53. Set the OPTICS MODE switch on the Indicator panel to ZERO. Set the TELESCOPE TRUNNION switch to 25°. The target number 2 reticle pattern shall appear to intersect the number 0 on the SCT vertical reticle line.

54. Set the TELESCOPE TRUNNION switch to 0°. The target number 2 reticle pattern shall appear to intersect the center of the SCT reticle pattern.

55. Set the TELESCOPE TRUNNION switch to SLAVE TO SXT.

56. Set the OPTICS MODE switch to ZERO, and after all zeroes are indicated on Row 1 and Row 2 of the DSKY'S, set the OPTICS MODE switch to MANUAL.

57. Set the CONTROLLER SPEED switch to HI and using the Optics hand controller, drive the SXT until Row 1 of the NAV DSKY indicates +27000. Set the CONTROLLER SPEED switch to LO and manipulate the Optics hand controller to fine position and hold the SXT so that Row 1 of the DSKY indicates 270.00°.

58. Insure the horizontal reticle line of the SCT is coincident with horizontal reticle line of target number 2 by adjusting the G & N Mounting Fixture cradle.

59. Sight through the SXT StLOS and, using the Optics hand controller, position the approximate center of the SXT StLOS reticle pattern to the number 10 resolution pattern of target number 1.

60. Sight through StLOS and LLOS and observe the number 10 and surrounding lines on target number 1 reticle. The number 10 and surrounding lines shall be clear and distinct. Record indication.

61. Position the SCT resolution card approximately 10 feet from the SCT trunnion axis.

62. Sight through the SCT LOS and, using the Optics hand controller, position the approximate center of the SCT LOS reticle pattern to the 3 min. resolution pattern of the resolution card.

63. Sight through the SCT and observe the number and surrounding lines on the resolution card. The number and surrounding lines shall be clear and distinct. Record indication.

64. Set the OPTICS MODE switch to ZERO, and after all zeroes are indicated on Row 1 and Row 2 of the DSKY'S, set the OPTICS MODE switch to MAN.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ________ CAL DATE

NAME ____________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4.	DSKY Row 2 display (Trunnion angle)	deg	-0007	( ) ________	+00006			(a)
	DKSY Row 1 display (Shaft angle)	deg	-00003	( ) ________	+00002			(b)
7	VDW Reading of WLLOS	deg min	▨	________ ________	▨			(c)
8	Convert line (c) to sec using Calibration chart	sec	▨	( ) ________	▨			(d)
	VDW Reading of WSTLOS	deg min	▨	________ ________	▨			(e)
	Convert line (e) to sec using calibration chart	sec	▨	( ) ________	▨			(f)

NOTE: VDW reading decreasing from 360° indicates (+) angle (seconds)
VDW reading increasing from 0° indicates (-) angle (seconds)

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

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NO. 12214
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
8	Calculate: Line (f) - Line (d) StLOS-LLOS Parallelism	sec	-15	( ) ________	+15			(g)
Imp	Transfer target calibration angle ϕ_3 from JDC 10003 Item C.1 to nearest whole second	deg min sec	▨	________ ________ ________	▨	▨	▨	(h)
10	Calculate: 45° - line (h) to nearest second	sec	▨	( ) ________	▨	▨	▨	(i)
	Calculate: Line (i) + Line (d)	sec	▨	( ) ________	▨	▨	▨	(j)
	Convert Line (j) to VDW reading using calibration chart **	deg min	▨	________ ________	▨	▨	▨	(k)
17	Record CMC NAV DSKY Row 2 display * 45°	Row 2 deg bits	▨	— — · — — — ________	▨	▨	▨	(l)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.
** If line (j) is -, add calibration chart indication to 0°00'.
If line (j) is +, subtract calibration chart indication from 359°60'.

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EQUIPMENT TEST
DATA SHEET 3 OF 9

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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17 (cont)		Row 2 deg bits	▨	— — · — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — · — — — ________	▨	▨	▨	
18	Select bit count 45°	bits	16382	________	16382			(m)
19	Calculate: Line (j) + 90 sec	sec	▨	( ) ________	▨	▨	▨	(n)
	Convert Line (n) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(o)
22	Record CMC NAV DSKY Row 2 Display *45° (+90")	Row 2 deg bits	▨	— — · — — — ________	▨	▨	▨	(p)
		Row 2 deg bits	▨	— — · — — — ________	▨	▨	▨	
		Row 2 deg bits	▨	— — · — — — ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
23	Select bit count 45° (+90")	bits						(q)
24	Calculate: Line (m) +00009 bits	bits		( ) ______				(r)
	Calculate: Line (q) - Line (r) G & N Accuracy Bits 45° (+90")	bits	-2	( ) ______	+2			(s)
	Calculate: Line (j) +30 sec	sec		( ) ______				(t)
	Convert Line (t) to VDW reading using calibration chart	deg min		______ ______				(u)
27	Record CMC NAV DSKY Row 2 display * 45° (+30")	Row 2 deg bits		— — . — — — — ______				(v)
		Row 2 deg bits		— — . — — — — ______				
		Row 2 deg bits		— — . — — — — ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC
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JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Select bit count 45° (+30")	bits		______				(w)
29	Calculate: Line (m) +00003 bits	bits		( ) ______				(x)
	Calculate: Line (n) - Line (x) G & N Accuracy BITS 45° (+30")	bits	-2	( ) ______	+2			(y)
	Calculate: Line (y) +60 sec	sec		( ) ______				(z)
	Convert Line (z) to VDW reading using calibration chart	deg min		______ ______				(aa)
32	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits		— — . — — — — ______				(ab)
		Row 2 deg bits		— — . — — — — ______				
		Row 2 deg bits		— — . — — — — ______				
33	Select bit count 45° (±60")	bits		______				(ac)

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO 12214
REV. -

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
34	Calculate: Line (m) + 00006 bits	bits		( ) ______				(ad)
	Calculate: Line (ac) - Line (ad) G & N Accuracy BITS 45° (±60")	bits	-2	( ) ______	+2			(ae)
	Calculate: Line (j) - 30 sec	sec		( ) ______				(af)
	Convert Line (af) to VDW reading using calibration chart	deg min		______ ______				(ag)
37	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		— — . — — — — ______				(ah)
		Row 2 deg bits		— — . — — — — ______				
		Row 2 deg bits		— — . — — — — ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC
NO. 12214
REV. -

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
38	Select bit count 45° (-30")	bits		______				(ai)
39	Calculate: Line (m) -00003 bits	bits		( ) ______				(aj)
	Calculate: Line (ai) - Line (aj) G & N Accuracy BITS 45° (-30")	bits	-2	( ) ______	+2			(ak)
	Calculate: Line (j) -90 sec	sec		( ) ______				(al)
	Convert Line (al) to VDW reading using calibration chart	deg min		______ ______				(am)
42	Record CMC NAV DSKY Row 2 display * CDU 45° (-30")	Row 2 deg bits		— — . — — — — ______				(an)
		Row 2 deg bits		— — . — — — — ______				

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC
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REV. -

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42 (cont)		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	
43	Select bit count 45° (-90")	bits	▨	________	▨	▨	▨	(ao)
44	Calculate: Line (m) -00009 bits	bits	▨	( )________	▨	▨	▨	(ap)
	Calculate: Line (ao) - Line (ap) G & N Accuracy BITS 45° (-90")	bits	-2	( )________	+2			(aq)
	Calculate: Line (j) -60 sec	sec	▨	( )________	▨	▨	▨	(ar)
	Convert Line (ar) to VDW reading using calibration chart	deg min	▨	________ ________	▨	▨	▨	(as)
47	Record CMC NAV DSKY Row 2 display *	Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	(at)
		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	

* Multiply CMC DSKY Row 2 x 364.09 to convert to bits.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 9

JDC
NO. 12214
REV. -

JOB OPTICS POSITIONAL ACCURACY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47 (cont)		Row 2 deg bits	▨	– – . – – – ________	▨	▨	▨	
48	Select bit count 45° (-60)")	bits	▨	________	▨	▨	▨	(au)
49	Calculate: Line (m) -00006 bits	bits	▨	( )________	▨	▨	▨	(av)
	Calculate: Line (au) - Line (av) G & N Accuracy BITS 45° (-60")	bits	-2	( )________	+2			(aw)
53	SCT (Offset 25°)	▨	▨	Reacted as Specified	▨			
54	SCT Comparision (Offset 0°)	▨	▨	Reacted as Specified	▨			
60	Image resolution	▨	clear and distinct		▨			
63	Image resolution	▨	clear and distinct		▨			

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JOB MASTER INITIALIZATION

JDC 12215 REV. A PAGE 1 OF 2

INITIAL TDRR 29882 D.S. PGS. 0

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

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			JDC	D.S.	MIT	NASA
A	11-10-66	31893	2	-	EA 415	-

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the BLOCK II and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR indicator or PSA HTR PWR indicator are lighted.

3. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

4. Insure that the following items of test equipment are turned on:

- Digital Recorder
- Dual Beam Oscilloscope
- Monitor Oscilloscope
- Signal Generator
- Digital Voltmeter

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JOB MASTER INITIALIZATION

JDC 12215 REV A PAGE 2 OF 2

SUBSYSTEM G & N SYSTEM

ASSY

- Counter
- Phase Angle Voltmeter
- Oscillograph
- Remote Counter Indicator

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Monitor the Test Control panel to determine that the following pushbuttons are lighted:

- CGC/LGC POWER ON
- 400 CPS POWER ON
- ISS OPERATE

NOTE: If system is not in the OPERATE mode refer to JDC 12204 for applicable turn on procedures.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Monitor the IRIG temperature deviation (from 135°F) on the DVM for in spec temperature limits (-3.25 v min to +4.0 v max).

8. Set the CROSSBAR CONTROL to 255. Monitor the PIP temperature deviation (from 130°F) on the DVM for in spec temperature limits (-2.5 v min to +2.5 v max).

9. Set the CROSSBAR CONTROL to 220.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

11. Insure the G & N Fixture Cradle Assembly is set to the 32.5° position unless specified otherwise in the JDC to be performed.

CAUTION: If the GIMBAL LOCK lamp on the DSKY is lighted, proceed to step 12.c.

12. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 40	NOUN 20	ENTR
c.	VERB 41	NOUN 20	ENTR
d.	+00000		ENTR
e.	+00000		ENTR
f.	+00000		ENTR
g.	VERB 16	NOUN 20	ENTR

h. Observe NO ATT lamp lights

The IMU Gimbal angles (0°) shall be displayed on Rows 1, 2, and 3 of the DSKY.

13. Deleted.

14. Insure the switches on the Indicator Control panel are set as follows:

a. COUPLING to DIRECT
b. MODE to MAN
c. TELESCOPE TRUNNION to SLAVE TO SXT
d. TRACKER to OFF
e. SPEED to LO
f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

15. Perform the following DSKY operations:

a.	VERB 57	ENTR
b.	00015	ENTR

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JOB MASTER INITIALIZATION

JDC 12215 **REV.** B **PAGE** 1 **OF** 2
INITIAL TDRR 29882 **D.S. PGS** 0

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
(M) A	11-10-66	31893	2	-	EA	-
B	11-17-66	31984	2	-	EA	-

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the BLOCK II and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR indicator or PSA HTR PWR indicator are lighted.

3. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

4. Insure that the following items of test equipment are turned on:

Digital Recorder
Dual Beam Oscilloscope
Monitor Oscilloscope
Signal Generator
Digital Voltmeter

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB MASTER INITIALIZATION
JDC 12215 **REV** B **PAGE** 2 **OF** 2

SUBSYSTEM G & N SYSTEM
ASSY

Counter
Phase Angle Voltmeter
Oscillograph
Remote Counter Indicator

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Monitor the Test Control panel to determine that the following pushbuttons are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

NOTE: If system is not in the OPERATE mode refer to JDC 12204 for applicable turn on procedures.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Monitor the IRIG temperature deviation (from 135°F) on the DVM for in spec temperature limits (-3.25 v min to +4.0 v max).

8. Set the CROSSBAR CONTROL to 255. Monitor the PIP temperature deviation (from 130°F) on the DVM for in spec temperature limits (-2.5 v min to +2.5 v max).

9. Set the CROSSBAR CONTROL to 220.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

11. Insure the G & N Fixture Cradle Assembly is set to the 32.5° position unless specified otherwise in the JDC to be performed.

CAUTION: If the GIMBAL LOCK lamp on the DSKY is lighted, proceed to step 12.c.

12. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 40	NOUN 20	ENTR
c.	VERB 41	NOUN 20	ENTR
d.	+00000		ENTR
e.	+00000		ENTR
f.	+00000		ENTR
g.	VERB 16	NOUN 20	ENTR

h. Observe
NO ATT lamp lights

The IMU Gimbal angles (0°) shall be displayed on Rows 1, 2, and 3 of the DSKY.

13. Deleted.

14. Insure the switches on the Indicator Control panel are set as follows:

a. COUPLING to DIRECT
b. MODE to MAN
c. TELESCOPE TRUNNION to SLAVE TO SXT
d. TRACKER to OFF
e. SPEED to LO
f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

15. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

16. Perform the following DSKY operations:

a.	VERB 57	ENTR
b.	00015	ENTR

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INITIAL TDRR 29882 D.S. PGS 0

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	11-10-66	31893	2	-	EA	-
B	11-17-66	31984	2	-	EA	-
C	1-26-67	32801	All	-	EA	-

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

1. Monitor the Monitor panel to insure that the BLOCK II and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM 00143A
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SUBSYSTEM G & N SYSTEM

ASSY

indicator or PSA HTR PWR indicator are lighted.

3. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

4. Insure that the following items of test equipment are turned on:

Digital Recorder
Dual Beam Oscilloscope
Monitor Oscilloscope
Signal Generator
Digital Voltmeter
Counter
Phase Angle Voltmeter
Oscillograph
Remote Counter Indicator

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Monitor the Test Control panel to determine that the following pushbuttons are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

NOTE: If system is not in the OPERATE mode refer to JDC 12204 for applicable turn on procedures.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Monitor the IRIG temperature deviation (from 135°F) on the DVM for in spec temperature limits (-3.25 v min to +4.0 v max).

8. Set the CROSSBAR CONTROL to 255. Monitor the PIP temperature deviation (from 130°F) on the DVM for in spec temperature limits (-2.5 v min to +2.5 v max).

9. Set the CROSSBAR CONTROL to 220.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

11. Insure the G & N Fixture Cradle Assembly is set to the 32.5° position unless specified otherwise in the JDC to be performed.

CAUTION: If the GIMBAL LOCK lamp on the DSKY is lighted, proceed to step 12.c.

12. Perform the following DSKY operations:

a. VERB 36		ENTR
b. VERB 40	NOUN 20	ENTR
c. VERB 41	NOUN 20	ENTR
d. +00000		ENTR
e. +00000		ENTR
f. +00000		ENTR
g. Observe		
VERB 41	NOUN 22	Displayed
NO ATT lamp lights		

13. Insure the switches on the Indicator Control panel are set as follows:

a. COUPLING to DIRECT
b. MODE to MAN
c. TELESCOPE TRUNNION to SLAVE TO SXT
d. TRACKER to OFF
e. SPEED to LO

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SUBSYSTEM G & N SYSTEM

ASSY

f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

14. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

15. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00015		ENTR
c. VERB 21	NOUN 01	ENTR
d. 00362		ENTR
e. 16002		ENTR

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INITIAL TDRR 29882 **D.S. PGS** 0

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31893	2	-	EA	-
B	11-17-66	31984	2	-	EA	-
C	1-26-67	32801	All	-	EA	-
D	8-24-67	34436	3	-	EA	-

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

1. Monitor the Monitor panel to insure that the BLOCK II and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM G & N SYSTEM

ASSY

indicator or PSA HTR PWR indicator are lighted.

3. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

4. Insure that the following items of test equipment are turned on:

Digital Recorder
Dual Beam Oscilloscope
Monitor Oscilloscope
Signal Generator
Digital Voltmeter
Counter
Phase Angle Voltmeter
Oscillograph
Remote Counter Indicator

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Monitor the Test Control panel to determine that the following pushbuttons are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

NOTE: If system is not in the OPERATE mode refer to JDC 12204 for applicable turn on procedures.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Monitor the IRIG temperature deviation (from 135°F) on the DVM for in spec temperature limits (-3.25 v min to +4.0 v max).

8. Set the CROSSBAR CONTROL to 255. Monitor the PIP temperature deviation (from 130°F) on the DVM for in spec temperature limits (-2.5 v min to +2.5 v max).

9. Set the CROSSBAR CONTROL to 220.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

11. Insure the G & N Fixture Cradle Assembly is set to the 32.5° position unless specified otherwise in the JDC to be performed.

CAUTION: If the GIMBAL LOCK lamp on the DSKY is lighted, proceed to step 12.c.

12. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR
g. Observe
VERB 41 NOUN 22 Displayed
NO ATT lamp lights

13. Insure the switches on the Indicator Control panel are set as follows:

a. COUPLING to DIRECT
b. MODE to MAN
c. TELESCOPE TRUNNION to SLAVE TO SXT
d. TRACKER to OFF
e. SPEED to LO

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SUBSYSTEM G & N SYSTEM

ASSY

f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

14. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

15. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 21 NOUN 01 ENTR
d. 00362 ENTR
e. 16002 ENTR

16. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 03770 ENTR
c. 10067 ENTR
d. 04317 ENTR
e. 01770 ENTR

17. Perform the following DSKY operations:

a. VERB 25 NOUN 26 ENTR
b. 01000 ENTR
c. 01770 ENTR
d. 00007 ENTR
e. VERB 30 ENTR

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INITIAL TDRR 29882 D.S. PGS 0

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31893	2	-	EA	-
B	11-17-66	31984	2	-	EA	-
C	1-26-67	32801	All	-	EA	-
D	8-24-67	34436	3	-	EA	-
E	9-29-67	34751	2,3	-	EA	-

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

1. Monitor the Monitor panel to insure that the BLOCK II and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM G & N SYSTEM | ASSY

indicator or PSA HTR PWR indicator are lighted.

3. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

4. Insure that the following items of test equipment are turned on:

Digital Recorder
Dual Beam Oscilloscope
Monitor Oscilloscope
Signal Generator
Digital Voltmeter
Counter
Phase Angle Voltmeter
Oscillograph
Remote Counter Indicator

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Monitor the Test Control panel to determine that the following pushbuttons are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

NOTE: If system is not in the OPERATE mode refer to JDC 12204 for applicable turn on procedures.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Monitor the IRIG temperature deviation (from 135°F) on the DVM for in spec temperature limits (-3.25 v min to +4.0 v max).

8. Set the CROSSBAR CONTROL to 255. Monitor the PIP temperature deviation (from 130°F) on the DVM for in spec temperature limits (-2.5 v min to +2.5 v max).

9. Set the CROSSBAR CONTROL to 220.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

11. Insure the G & N Fixture Cradle Assembly is set to the 32.5° position unless specified otherwise in the JDC to be performed.

CAUTION: If the GIMBAL LOCK lamp on the DSKY is lighted, proceed to step 12.c.

12. Perform the following DSKY operations:

a. VERB 36		ENTR
b. VERB 40	NOUN 20	ENTR
c. VERB 41	NOUN 20	ENTR
d. +00000		ENTR
e. +00000		ENTR
f. +00000		ENTR
g. Observe		
VERB 41	NOUN 22	Displayed
NO ATT lamp lights		

NOTE: Step 13 applies to Indicator Control panel 2021290 only. Step 13A applies to all Indicator Control panels except 2021290.

13. Insure switches on the Indicator Control panel are set as follows:

a. OPTICS COUPLING to DIRECT

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b. OPTICS MODE to MAN
c. OPTICS TEL TRUN to SLAVE TO SXT
d. OPTICS ZERO to OFF
e. OPTICS SPEED to LO
f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

13A. Insure switches on the Indicator Control panel are set as follows:

a. OPTICS CONTROLLER COUPLING to DIRECT
b. OPTICS MODE to MAN
c. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT
d. OPTICS TRACKER to OFF
e. OPTICS CONTROLLER SPEED to LO
f. CONDITION LAMPS to ON
g. UPTELEMETRY to ACCEPT.

14. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

15. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00015		ENTR
c. VERB 21	NOUN 01	ENTR
d. 00362		ENTR
e. 16002		ENTR

16. Perform the following DSKY operations:

a. VERB 25	NOUN 01	ENTR
b. 03770		ENTR
c. 10067		ENTR
d. 04317		ENTR
e. 01770		ENTR

17. Perform the following DSKY operations:

a. VERB 25	NOUN 26	ENTR
b. 01000		ENTR
c. 01770		ENTR
d. 00007		ENTR
e. VERB 30		ENTR

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INITIAL TDRR 29882 D.S. PGS 0

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	11-10-66	31893	2	-	EA	-
B	11-17-66	31984	2	-	EA	-
C	1-26-67	32801	All	-	EA	-
D	8-24-67	34436	3	-	EA	-
E	9-29-67	34751	2,3	-	EA	-
F	4-26-68	36144	1,3	-	EA	-

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper set-up procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

3. Insure that connector assembly (2003099) is removed and cable W226-P1 is connected to CGC test connector before proceeding with this JDC.

1. Monitor the Monitor panel to insure that the BLOCK II and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB MASTER INITIALIZATION

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SUBSYSTEM G & N SYSTEM

ASSY

indicator or PSA HTR PWR indicator are lighted.

3. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

4. Insure that the following items of test equipment are turned on:

Digital Recorder
Dual Beam Oscilloscope
Monitor Oscilloscope
Signal Generator
Digital Voltmeter
Counter
Phase Angle Voltmeter
Oscillograph
Remote Counter Indicator

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Monitor the Test Control panel to determine that the following pushbuttons are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

NOTE: If system is not in the OPERATE mode refer to JDC 12204 for applicable turn on procedures.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Monitor the IRIG temperature deviation (from 135°F) on the DVM for in spec temperature limits (-3.25 v min to +4.0 v max).

8. Set the CROSSBAR CONTROL to 255. Monitor the PIP temperature deviation (from 130°F) on the DVM for in spec temperature limits (-2.5 v min to +2.5 v max).

9. Set the CROSSBAR CONTROL to 220.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

11. Insure the G & N Fixture Cradle Assembly is set to the 32.5° position unless specified otherwise in the JDC to be performed.

CAUTION: If the GIMBAL LOCK lamp on the DSKY is lighted, proceed to step 12.c.

12. Perform the following DSKY operations:

a. VERB 36		ENTR
b. VERB 40	NOUN 20	ENTR
c. VERB 41	NOUN 20	ENTR
d. +00000		ENTR
e. +00000		ENTR
f. +00000		ENTR
g. Observe		
VERB 41 NO ATT lamp lights	NOUN 22	Displayed

NOTE: Step 13 applies to Indicator Control panel 2021290 only. Step 13A applies to all Indicator Control panels except 2021290.

13. Insure switches on the Indicator Control panel are set as follows:

a. OPTICS COUPLING to DIRECT

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SUBSYSTEM G & N SYSTEM

ASSY

b. OPTICS MODE to MAN
c. OPTICS TEL TRUN to SLAVE TO SXT
d. OPTICS ZERO to OFF
e. OPTICS SPEED to LO
f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

13A. Insure switches on the Indicator Control panel are set as follows:

a. OPTICS CONTROLLER COUPLING to DIRECT
b. OPTICS MODE to MAN
c. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT
d. OPTICS TRACKER to OFF
e. OPTICS CONTROLLER SPEED to LO
f. CONDITION LAMPS to ON
g. UPTELEMETRY to ACCEPT.

14. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

15. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00015		ENTR
c. VERB 21	NOUN 01	ENTR
d. 00362		ENTR
e. 16002		ENTR

16. Perform the following DSKY operations:

a. VERB 25	NOUN 01	ENTR
b. 03770		ENTR
c. 10067		ENTR
d. 04317		ENTR
e. 01770		ENTR

17. Perform the following DSKY operations:

a. VERB 25	NOUN 26	ENTR
b. 01000		ENTR
c. 01770		ENTR
d. 00007		ENTR
e. VERB 30		ENTR

18. Insure that OPT/ISS switch on 1 PA #2 is set to ISS.

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SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31893	2	-	EA	-
B	11-17-66	31984	2	-	EA	-
C	1-26-67	32801	All	-	EA	-
D	8-24-67	34436	3	-	EA	-
E	9-29-67	34751	2,3	-	EA	-
F	4-26-68	36144	1,3	-	EA	-
G	6-10-68	36309	All	-	EA	-

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper set-up procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

3. Insure that connector assembly (2003099) is removed and cable W226-P1 is connected to CGC test connector if required by JDC being performed.

1. Monitor the Monitor panel to insure that the BLOCK II and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR indicator or PSA HTR PWR indicator are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM G & N SYSTEM | ASSY

3. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

4. Insure that the following items of test equipment are turned on:

- Digital Recorder
- Dual Beam Oscilloscope
- Monitor Oscilloscope
- Signal Generator
- Digital Voltmeter
- Counter
- Phase Angle Voltmeter
- Oscillograph
- Remote Counter Indicator

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Monitor the Test Control panel to determine that the following pushbuttons are lighted:

- CGC/LGC POWER ON
- 400 CPS POWER ON
- ISS OPERATE

NOTE: If system is not in the OPERATE mode refer to JDC 12204 for applicable turn on procedures.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Monitor the IRIG temperature deviation (from 135°F) on the DVM for in spec temperature limits (-3.25 v min to +4.0 v max).

8. Set the CROSSBAR CONTROL to 255. Monitor the PIP temperature deviation (from 130°F) on the DVM for in spec temperature limits (-2.5 v min to +2.5 v max).

9. Set the CROSSBAR CONTROL to 220.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

11. Insure the G & N Fixture Cradle Assembly is set to the 32.5° position unless specified otherwise in the JDC to be performed.

CAUTION: If the GIMBAL LOCK lamp on the DSKY is lighted, proceed to step 12.c.

12. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe:
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe:
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe:
VERB 41 NOUN 22 Displayed
k. Observe:
NO ATT lamp lights

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SUBSYSTEM G & N SYSTEM | ASSY

NOTE: Step 13 applies to Indicator Control panel 2021290 only. Step 13A applies to all Indicator Control panels except 2021290.

13. Insure switches on the Indicator Control panel are set as follows:

a. OPTICS COUPLING to DIRECT
b. OPTICS MODE to MAN
c. OPTICS TEL TRUN to SLAVE TO SXT
d. OPTICS ZERO to OFF
e. OPTICS SPEED to LO
f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

13A. Insure switches on the Indicator Control panel are set as follows:

a. OPTICS CONTROLLER COUPLING to DIRECT
b. OPTICS MODE to MAN
c. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT
d. OPTICS TRACKER to OFF
e. OPTICS CONTROLLER SPEED to LO
f. CONDITION LAMPS to ON
g. UPTELEMETRY to ACCEPT.

14. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

15. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 21 NOUN 01 ENTR
d. 00362 ENTR
e. 16002 ENTR

16. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 03770 ENTR
c. 10067 ENTR
d. 04317 ENTR
e. 01770 ENTR

17. Perform the following DSKY operations:

a. VERB 25 NOUN 26 ENTR
b. 01000 ENTR
c. 01770 ENTR
d. 00007 ENTR
e. VERB 30 ENTR
f. Observe:
COMP ACTY lamp is lighted

18. Insure that OPT/ISS switch on TPA #2 is set to ISS.

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INITIAL TDRR 29882 D.S. PGS 0

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	11-10-66	31893	2	-	EA	-
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C	1-26-67	32801	All	-	EA	-
D	8-24-67	34436	3	-	EA	-
E	9-29-67	34751	2,3	-	EA	-
F	4-26-68	36144	1,3	-	EA	-
G	6-10-68	36309	All	-	EA	-
H	4-14-69	37497	3	-	EA	-

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

3. Insure that connector assembly (2003099) is removed and cable W226-P1 is connected to CGC test connector if required by JDC being performed.

1. Monitor the Monitor panel to insure that the BLOCK II and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR

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indicator or PSA HTR PWR indicator are lighted.

3. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

4. Insure that the following items of test equipment are turned on:

Digital Recorder
Dual Beam Oscilloscope
Monitor Oscilloscope
Signal Generator
Digital Voltmeter
Counter
Phase Angle Voltmeter
Oscillograph
Remote Counter Indicator

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Monitor the Test Control panel to determine that the following pushbuttons are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

NOTE: If system is not in the OPERATE mode refer to JDC 12204 for applicable turn on procedures.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Monitor the IRIG temperature deviation (from 135°F) on the DVM for in spec temperature limits (-3.25 v min to +4.0 v max).

8. Set the CROSSBAR CONTROL to 255. Monitor the PIP temperature deviation (from 130°F) on the DVM for in spec temperature limits (-2.5 v min to +2.5 v max).

9. Set the CROSSBAR CONTROL to 220.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

11. Insure the G & N Fixture Cradle Assembly is set to the 32.5° position unless specified otherwise in the JDC to be performed.

CAUTION: If the GIMBAL LOCK lamp on the DSKY is lighted, proceed to step 12.c.

12. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe:
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe:
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe:
VERB 41 NOUN 22 Displayed
k. Observe:
NO ATT lamp lights

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NOTE: Step 13 applies to Indicator Control panel 2021290 only. Step 13A applies to all Indicator Control panels except 2021290.

13. Insure switches on the Indicator Control panel are set as follows:

a. OPTICS COUPLING to DIRECT
b. OPTICS MODE to MAN
c. OPTICS TEL TRUN to SLAVE TO SXT
d. OPTICS ZERO to OFF
e. OPTICS SPEED to LO
f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

13A. Insure switches on the Indicator Control panel are set as follows:

a. OPTICS CONTROLLER COUPLING to DIRECT
b. OPTICS MODE to MAN
c. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT
d. OPTICS TRACKER to OFF
e. OPTICS CONTROLLER SPEED to LO
f. CONDITION LAMPS to ON
g. UPTELEMETRY to ACCEPT.

14. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

15. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 03700 ENTR
c. 33663 ENTR
d. NOUN 15 ENTR
e. 55426 ENTR ENTR
f. 04064 ENTR ENTR
g. 15374 ENTR
h. VERB 25 NOUN 26 ENTR
i. 20000 ENTR
j. 01700 ENTR
k. 12007 ENTR
l. VERB 30 ENTR
m. VERB 21 NOUN 01 ENTR
n. 00362 ENTR
o. 16002 ENTR

16. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 03770 ENTR
c. 10067 ENTR
d. 04317 ENTR
e. 01770 ENTR

17. Perform the following DSKY operations:

a. VERB 25 NOUN 26 ENTR
b. 01000 ENTR
c. 01770 ENTR
d. 00007 ENTR
e. VERB 30 ENTR
f. Observe:
COMP ACTY lamp is lighted and remains lighted without blinking until specified otherwise or power turn-off. If light goes off momentarily, testing shall immediately cease until determination of the cause and performance of the indicated remedial action.

18. Insure that OPT/ISS switch on TPA #2 is set to ISS.

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SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

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			JDC	D.S.	MIT	NASA
A	11-10-66	31893	2	-	EA	-
B	11-17-66	31984	2	-	EA	-
C	1-26-67	32801	All	-	EA	-
D	8-24-67	34436	3	-	EA	-
E	9-29-67	34751	2,3	-	EA	-
F	4-26-68	36144	1,3	-	EA	-
G	6-10-68	36309	All	-	EA	-
H	4-14-69	37497	3	-	EA	-
J	5-26-70	38126	1, 2, 4	-	EA	-

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper set-up procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

3. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is removed and cable W226-P1 is connected to CGC test connector if required by JDC being performed.

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SUBSYSTEM G & N SYSTEM

ASSY

1. Monitor the Monitor panel to insure that the BLOCK II and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR indicator or PSA HTR PWR indicator are lighted.

3. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

4. Insure that the following items of test equipment are turned on:

Digital Recorder
Dual Beam Oscilloscope
Monitor Oscilloscope
Signal Generator
Digital Voltmeter
Counter
Phase Angle Voltmeter
Oscillograph
Remote Counter Indicator

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Monitor the Test Control panel to determine that the following pushbuttons are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

NOTE: If system is not in the OPERATE mode refer to JDC 12204 for applicable turn on procedures.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Monitor the IRIG temperature deviation (from 135°F) on the DVM for in spec temperature limits (-3.25 v min to +4.0 v max).

8. Set the CROSSBAR CONTROL to 255. Monitor the PIP temperature deviation (from 130°F) on the DVM for in spec temperature limits (-2.5 v min to +2.5 v max).

9. Set the CROSSBAR CONTROL to 220.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Step 10A applies only if Restart Monitor module (2898989) is installed.

10A. Perform the following DSKY entries:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton on DSKY.

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike cradle locking handles.

11. Insure the G & N Fixture Cradle Assembly is set to the 32.5° position unless specified otherwise in the JDC to be performed.

CAUTION: If the GIMBAL LOCK lamp on the DSKY is lighted, proceed to step 12.c.

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12. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
Wait 5 seconds
c. VERB 41 NOUN 20 ENTR
d. Observe:
VERB 21 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 22 NOUN 22 Flashing
g. +00000 ENTR
h. Observe:
VERB 23 NOUN 22 Flashing
i. +00000 ENTR
j. Observe:
VERB 41 NOUN 22 Displayed
k. Observe:
NO ATT lamp lights

NOTE: Step 13 applies to Indicator Control panel 2021290 only. Step 13A applies to all Indicator Control panels except 2021290.

13. Insure switches on the Indicator Control panel are set as follows:

a. OPTICS COUPLING to DIRECT
b. OPTICS MODE to MAN
c. OPTICS TEL TRUN to SLAVE TO SXT
d. OPTICS ZERO to OFF
e. OPTICS SPEED to LO
f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

13A. Insure switches on the Indicator Control panel are set as follows:

a. OPTICS CONTROLLER COUPLING to DIRECT
b. OPTICS MODE to MAN
c. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT
d. OPTICS TRACKER to OFF
e. OPTICS CONTROLLER SPEED to LO
f. CONDITION LAMPS to ON
g. UPTELEMETRY to ACCEPT.

14. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

15. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 03700 ENTR
c. 33663 ENTR
d. NOUN 15 ENTR
e. 55426 ENTR ENTR
f. 04064 ENTR ENTR
g. 15374 ENTR
h. VERB 25 NOUN 26 ENTR
i. 20000 ENTR
j. 01700 ENTR
k. 12007 ENTR
l. VERB 30 ENTR
m. VERB 21 NOUN 01 ENTR
n. 00362 ENTR
o. 16002 ENTR

16. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 03770 ENTR
c. 10067 ENTR
d. 04317 ENTR
e. 01770 ENTR

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SUBSYSTEM G & N SYSTEM

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17. Perform the following DSKY operations:

a. VERB 25 NOUN 26 ENTR
b. 01000 ENTR
c. 01770 ENTR
d. 00007 ENTR
e. VERB 30 ENTR
f. Observe:

COMP ACTY lamp is lighted and remains lighted without blinking until specified otherwise or power turn-off. If light goes off momentarily, testing shall immediately cease until determination of the cause and performance of the indicated remedial action.

18. Insure that OPT/ISS switch on TPA #2 is set to ISS.

NOTE: Step 19 applies only if Restart Monitor module (2898989) is installed.

19. Perform the following DSKY entries:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

NOTE: The contents of Row 1 should be interpreted as follows.

Channel 77 Code (Octal)		Alarm Source
001	**	*Parity Fail (F Memory)
003	**	*Parity Fail (E Memory)
004	**	TC Trap
010	**	Rupt Lock
020	**	Nightwatchman
040	***	Voltage Fail
100		Counter Fail
200		Scaler Fail
400		Scaler Double Frequency Alarm

*NOTE: Parity Fail will occur in either E or F Memory, but not in combination.

**NOTE: Depending on when the various alarms occur, a Counter Fail alarm may also occur and bit 7 will therefore also be set.

***NOTE: Other alarms will probably occur before the Voltage Fail alarm, in which case the contents of Channel 77 will contain the octal sum of all the alarms but it will contain the Voltage Fail Code.

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SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

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			JDC	D.S.	MIT	NASA

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the BLOCK II and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR indicator or PSA HTR PWR indicator are lighted.

3. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

4. Insure that the following items of test equipment are turned on:

Digital Recorder
Dual Beam Oscilloscope
Monitor Oscilloscope
Signal Generator
Digital Voltmeter

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Counter
Phase Angle Voltmeter
Oscillograph
Remote Counter Indicator

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Monitor the Test Control panel to determine that the following pushbuttons are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

NOTE: If system is not in the OPERATE mode refer to JDC 12204 for applicable turn on procedures.

7. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Monitor the IRIG temperature deviation (from 135°F) on the DVM for in spec temperature limits (-3.25 v min to +4.0 v max).

8. Set the CROSSBAR CONTROL to 255. Monitor the PIP temperature deviation (from 130°F) on the DVM for in spec temperature limits (-2.5 v min to +2.5 v max).

9. Set the CROSSBAR CONTROL to 220.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

11. Insure the G & N Fixture Cradle Assembly is set to the 32.5° position unless specified otherwise in the JDC to be performed.

CAUTION: If the GIMBAL LOCK lamps on the DSKY's are lighted, proceed to step 12.c.

12. Perform the following MAIN DSKY operations:

a.	VERB 36		ENTR
b.	VERB 40	NOUN 20	ENTR
c.	VERB 41	NOUN 20	ENTR
d.	+00000		ENTR
e.	+00000		ENTR
f.	+00000		ENTR
g.	VERB 16	NOUN 20	ENTR

h. Observe NO ATT lamp lights

The IMU Gimbal angles (0°) shall be displayed on Rows 1, 2, and 3 of the MAIN and NAV DSKY's.

13. Insure that the OPTICS POWER ON pushbutton on the Test Control panel is lighted.

14. Insure the switches on the Indicator Control panel are set as follows:

a. COUPLING to DIRECT
b. MODE to MAN
c. TELESCOPE TRUNNION to SLAVE TO SXT
d. TRACKER to OFF
e. SPEED to LO
f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

15. Perform the following NAV DSKY operations:

a.	VERB 57	ENTR
b.	00015	ENTR

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV. A PAGE 1 OF 6
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SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

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REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Establish a Master Initialization condition and insure the Cradle Assembly is set to 32.5°.

2. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	Observe VERB 21	NOUN 01	Flashing
c.	00010		ENTR
d.	Observe VERB 06	NOUN 01	Flashing
e.	Observe PROG 07		Displayed

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0°, are displayed on Rows 1, 2 and 3 of the NAV DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the NAV DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error
b. TB4, 44(hi), 48(lo), MG AC D/A Error
c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE COSINE, TOTAL NULL

14. Perform the following DSKY operations:

a.	VERB 33	ENTR
b.	Observe NO ATT lamp lights	

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c.	Observe VERB 06	NOUN 05	Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKYs and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKYs.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the NAV DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKYs and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKYs.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a.	VERB 33		ENTR
b.	Observe NO ATT lamp lights		
c.	Observe VERB 06	NOUN 12	Flashing after approx. 20 seconds

23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the NAV DSKY. The GIMBAL LOCK lamps on the DSKYs and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

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24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKYs and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKYs.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a.	VERB 33		ENTR
b.	Observe NO ATT lamp lights		
c.	Observe VERB 06	NOUN 15	Flashing after approx. 20 seconds

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the NAV DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1Z resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

-GIMBAL LOCK TEST

33. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp lights
c. Observe
VERB 06 NOUN 17 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKYs and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3 of the DSKYs.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKYs and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKYs and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100 ENTR
b. Observe
VERB 22 NOUN 22 Flashing
c. +00100 ENTR

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d. Observe
VERB 23 NOUN 22 Flashing
e. +00100 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing. The ISS WARNING and alarm lamps on the Monitor panel and the Indicator Control panel shall light.

40. Row 1 of the DSKYs shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds
c. +03375 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +03375 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +03375 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing. The ISS WARNING and alarm lamps on the Monitor panel and the Indicator Control panel shall light.

42. Row 1 of the DSKYs shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
NO ATT lamp lights
d. Observe
VERB 06 NOUN 55 Flashing after approx. 20 seconds

44. Set the OPTICS MODE switch on the Indicator Control panel to MAN then to ZERO. Wait 15 seconds.

45. Set the OPTICS MODE switch to CMC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00

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EQUIPMENT TEST
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JDC NO. 12216
REV. A
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	0.0		+11.0		
9.b	Sin AMG 1X	deg	0.0		+11.0		
9.c	Sin AOG 1X	deg	0.0		+11.0		
9.d	Cos AIG 1X	deg	0.0		+11.0		

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JDC NO. 12216
REV. A

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	0.0		+11.0		
9.f	Cos AOG 1X	deg	0.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	-0.30		+0.30		
12.b	MG AC D/A Error	volts rms	-0.30		+0.30		
12.c	OG AC D/A Error	volts rms	-0.30		+0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

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JDC
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JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+180		+191		
29.b	Sin AMG 1X	deg	+180		+191		
29.c	Sin AOG 1X	deg	+180		+191		
29.d	Cos AIG 1X	deg	0		+11.0		
29.e	Cos AMG 1X	deg	0		+11.0		
29.f	Cos AOG 1X	deg	0		+11.0		

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JDC
NO. 12216
REV. A

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00014	Row 1	00018		
			00000	Row 2	00000		
36	IG CDU rate	deg/sec	00014	Row 1	00018		
			00000	Row 2	00000		
37	OG CDU rate	deg/sec	00014	Row 1	00018		
			00000	Row 2	00000		
46	Shaft CDU rate	deg/sec	00014	Row 1	00018		
			00000	Row 2	00000		
47	TRUNNION CDU rate	deg/sec	00007	Row 1	00009		
			00000	Row 2	00000		
1, 2 3, 4 6, 7 14, 15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

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EQUIPMENT TEST
DATA SHEET 5 OF 5

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JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

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INITIAL TDRR 29882 D.S. PGS 5

JOB SEMI AUTOMATIC MODE TEST

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	PS-2015000
A	9-1-66	30931	2, 4	-	JP	-	
B	11-10-66	31896	All	-	EA	-	
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

1. Establish a Master Initialization condition and insure the Cradle Assembly is set to 32.5°.

1A. Press OPTICS POWER ON pushbutton on Test Control panel until pushbutton is lighted.

2. Perform the following DSKY operations:

a. VERB 57 ENTR
b. Observe VERB 21 NOUN 01 Flashing
c. 00010 ENTR
d. Observe VERB 06 NOUN 01 Flashing
e. Observe PROG 07 Displayed

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error
b. TB4, 44(hi), 48(lo), MG AC D/A Error
c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE COSINE, TOTAL NULL

14. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe NO ATT lamp lights

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c. Observe VERB 06 NOUN 05 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe NO ATT lamp lights
c. Observe VERB 06 NOUN 12 Flashing after approx. 20 seconds

23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY. The GIMBAL LOCK lamps on the DSKY and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

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24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe NO ATT lamp lights
c. Observe VERB 06 NOUN 15 Flashing after approx. 20 seconds

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1Z resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

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-GIMBAL LOCK TEST

33. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
NO ATT lamp lights

c. Observe
VERB 06 NOUN 17 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3of the DSKY.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
NO ATT lamp goes out

c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKY and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100 ENTR

b. Observe
VERB 22 NOUN 22 Flashing

c. +00100 ENTR

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d. Observe
VERB 23 NOUN 22 Flashing

e. +00100 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing. The ISS WARNING and alarm lamps on the Monitor panel and the Indicator Control panel shall light.

40. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
ISS WARNING lamp goes out

c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

c. +03375 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. +03375 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. +03375 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing. The ISS WARNING and alarm lamps on the Monitor panel and the Indicator Control panel shall light.

42. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
ISS WARNING lamp goes out

c. Observe
NO ATT lamp lights

d. Observe
VERB 06 NOUN 55 Flashing after approx. 20 seconds

44. Set the OPTICS MODE switch on the Indicator Control panel to MAN then to ZERO. Wait 15 seconds.

45. Set the OPTICS MODE switch to CGC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34 ENTR

b. Observe
PROG lamp indicates 00

49. Press OPTICS POWER ON pushbutton on Test Control panel. The pushbutton shall go out.

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FORM 00144
Chg. 7-23-65

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JDC
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REV. B
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JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	0.0		+11.0		
9.b	Sin AMG 1X	deg	0.0		+11.0		
9.c	Sin AOG 1X	deg	0.0		+11.0		
9.d	Cos AIG 1X	deg	0.0		+11.0		

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EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12216
REV. B

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	0.0		+11.0		
9.f	Cos AOG 1X	deg	0.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	-0.30		+0.30		
12.b	MG AC D/A Error	volts rms	-0.30		+0.30		
12.c	OG AC D/A Error	volts rms	-0.30		+0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12216
REV. B

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+180		+191		
29.b	Sin AMG 1X	deg	+180		+191		
29.c	Sin AOG 1X	deg	+180		+191		
29.d	Cos AIG 1X	deg	0		+11.0		
29.e	Cos AMG 1X	deg	0		+11.0		
29.f	Cos AOG 1X	deg	0		+11.0		

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DATA SHEET 4 OF 5

JDC
NO. 12216
REV. B

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00014	Row 1	00018		
			00000	Row 2	00000		
36	IG CDU rate	deg/sec	00014	Row 1	00018		
			00000	Row 2	00000		
37	OG CDU rate	deg/sec	00014	Row 1	00018		
			00000	Row 2	00000		
46	Shaft CDU rate	deg/sec	00014	Row 1	00018		
			00000	Row 2	00000		
47	TRUNNION CDU rate	deg/sec	00007	Row 1	00009		
			00000	Row 2	00000		
1, 2 3, 4 6, 7 14, 15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
REV. B

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

DATE 30 JUN 66

JDC 12216 REV. C PAGE 1 OF 7

JOB SEMI AUTOMATIC MODE TEST

INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Establish a Master Initialization condition in accordance with JDC 12215 and insure the Cradle Assembly is set to 32.5°.

1A. Press OPTICS POWER ON pushbutton on Test Control panel until pushbutton is lighted.

2. Perform the following DSKY operations:

a. VERB 57		ENTR
b. Observe VERB 21	NOUN 01	Flashing
c. 00010		ENTR
d. Observe VERB 06	NOUN 01	Flashing
e. Observe PROG 07		Displayed

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error

b. TB4, 44(hi), 48(lo), MG AC D/A Error

c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE COSINE, TOTAL NULL

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

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14. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe NO ATT lamp lights		
c. Observe VERB 06	NOUN 05	Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe NO ATT lamp lights		
c. Observe VERB 06	NOUN 12	Flashing after approx. 20 seconds

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

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23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY. The GIMBAL LOCK lamps on the DSKY and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe NO ATT lamp lights		
c. Observe VERB 06	NOUN 15	Flashing after approx. 20 seconds

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1Z resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp

SUBSYSTEM G & N SYSTEM | ASSY

shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

33. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
NO ATT lamp lights

c. Observe
VERB 06 NOUN 17 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

SUBSYSTEM G & N SYSTEM | ASSY

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
NO ATT lamp goes out

c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKY and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100 ENTR

b. Observe
VERB 22 NOUN 22 Flashing

c. +00100 ENTR

d. Observe
VERB 23 NOUN 22 Flashing

e. +00100 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing. The ISS WARNING and alarm lamps on the Monitor panel and the Indicator Control panel shall light.

40. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
ISS WARNING lamp goes out

c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

d. +03375 ENTR

e. Observe
VERB 22 NOUN 22 Flashing

f. +03375 ENTR

g. Observe
VERB 23 NOUN 22 Flashing

h. +03375 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing. The ISS WARNING and alarm lamps on the Monitor panel and the Indicator Control panel shall light.

42. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
ISS WARNING lamp goes out

c. Observe
NO ATT lamp lights

SUBSYSTEM G & N SYSTEM | ASSY

d. Observe
VERB 06 NOUN 55 Flashing after approx. 20 seconds

44. Set the OPTICS MODE switch on the Indicator Control panel to MAN then to ZERO. Wait 15 seconds.

45. Set the OPTICS MODE switch to CGC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34 ENTR

b. Observe
PROG lamp indicates 00

49. Press OPTICS POWER ON pushbutton on Test Control panel. The pushbutton shall go out.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC NO. 12216
REV. C
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	0.0		+11.0		
9.b	Sin AMG 1X	deg	0.0		+11.0		
9.c	Sin AOG 1X	deg	0.0		+11.0		
9.d	Cos AIG 1X	deg	0.0		+11.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12216
REV. C

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	0.0		+11.0		
9.f	Cos AOG 1X	deg	0.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	-0.30		+0.30		
12.b	MG AC D/A Error	volts rms	-0.30		+0.30		
12.c	OG AC D/A Error	volts rms	-0.30		+0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12216
REV. C

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+180		+191		
29.b	Sin AMG 1X	deg	+180		+191		
29.c	Sin AOG 1X	deg	+180		+191		
29.d	Cos AIG 1X	deg	0		+11.0		
29.e	Cos AMG 1X	deg	0		+11.0		
29.f	Cos AOG 1X	deg	0		+11.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12216
REV. C

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
36	IG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
37	OG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
46	Shaft CDU rate	deg/sec	00006 32000	Row 1 Row 2	00008 32000		
47	TRUNNION CDU rate	deg/sec	00001 33000	Row 1 Row 2	00002 33000		
1, 2 3, 4 6, 7 14, 15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
REV. C

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

DATE 30 JUN 66

JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV. D PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-
D	11-17-66	31933	6	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Establish a Master Initialization condition in accordance with JDC 12215 and insure the Cradle Assembly is set to 32.5°.

1A. Press OPTICS POWER ON pushbutton on Test Control panel until pushbutton is lighted.

2. Perform the following DSKY operations:

a. VERB 57		ENTR	
b. Observe VERB 21	NOUN 01	Flashing	
c. 00010		ENTR	
d. Observe VERB 06	NOUN 01	Flashing	
e. Observe PROG 07		Displayed	

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB SEMI AUTOMATIC MODE SYSTEM | JDC 12216 REV D PAGE 2 OF 7

SUBSYSTEM G & N SYSTEM | ASSY

6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error
b. TB4, 44(hi), 48(lo), MG AC D/A Error
c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE COSINE, TOTAL NULL

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV D PAGE 3 OF 7

SUBSYSTEM G & N SYSTEM | ASSY

14. Perform the following DSKY operations:

a. VERB 33		ENTR	
b. Observe NO ATT lamp lights			
c. Observe VERB 06	NOUN 05	Flashing after approx. 20 seconds	

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a. VERB 33		ENTR"	
b. Observe NO ATT lamp lights			
c. Observe VERB 06	NOUN 12	Flashing after approx. 20 seconds	

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV D PAGE 4 OF 7

SUBSYSTEM G & N SYSTEM | ASSY

Control panel will not light as specified.

23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY. The GIMBAL LOCK lamps on the DSKY and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a. VERB 33		ENTR	
b. Observe NO ATT lamp lights			
c. Observe VERB 06	NOUN 15	Flashing after approx. 20 seconds	

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1Z resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp

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shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

-GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

33. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp lights
c. Observe
VERB 06 NOUN 17 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3of the DSKY.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKY and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100 ENTR
b. Observe
VERB 22 NOUN 22 Flashing
c. +00100 ENTR
d. Observe
VERB 23 NOUN 22 Flashing
e. +00100 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing.

40. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds
d. +03375 ENTR
e. Observe
VERB 22 NOUN 22 Flashing
f. +03375 ENTR
g. Observe
VERB 23 NOUN 22 Flashing
h. +03375 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing.

42. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
NO ATT lamp lights

---

d. Observe
VERB 06 NOUN 55 Flashing after approx. 20 seconds

44. Set the OPTICS MODE switch on the Indicator Control panel to MAN then to ZERO. Wait 15 seconds.

45. Set the OPTICS MODE switch to CGC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00

49. Press OPTICS POWER ON pushbutton on Test Control panel. The pushbutton shall go out.

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EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12216
REV. D
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	0.0		+11.0		
9.b	Sin AMG 1X	deg	0.0		+11.0		
9.c	Sin AOG 1X	deg	0.0		+11.0		
9.d	Cos AIG 1X	deg	0.0		+11.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC NO. 12216
REV. D

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	0.0		+11.0		
9.f	Cos AOG 1X	deg	0.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	-0.30		+0.30		
12.b	MG AC D/A Error	volts rms	-0.30		+0.30		
12.c	OG AC D/A Error	volts rms	-0.30		+0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC NO. 12216
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JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+180		+191		
29.b	Sin AMG 1X	deg	+180		+191		
29.c	Sin AOG 1X	deg	+180		+191		
29.d	Cos AIG 1X	deg	0		+11.0		
29.e	Cos AMG 1X	deg	0		+11.0		
29.f	Cos AOG 1X	deg	0		+11.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC NO. 12216
REV. D

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00012	Row 1	00016		
			00000	Row 2	00000		
36	IG CDU rate	deg/sec	00012	Row 1	00016		
			00000	Row 2	00000		
37	OG CDU rate	deg/sec	00012	Row 1	00016		
			00000	Row 2	00000		
46	Shaft CDU rate	deg/sec	00006	Row 1	00008		
			32000	Row 2	32000		
47	TRUNNION CDU rate	deg/sec	00001	Row 1	00002		
			33000	Row 2	33000		
1, 2 3, 4 6, 7 14,15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC NO. 12216
REV. D

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

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JOB SEMI AUTOMATIC MODE TEST

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INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-
D	11-17-66	31933	6	-	EA	-
E	1-12-67	32622	1, 6	-	EA	-

REFERENCES

PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Perform JDC 12215 to establish a Master Initialization condition.

1A. Press OPTICS POWER ON pushbutton on Test Control panel until pushbutton is lighted.

2. Perform the following DSKY operations:

a. VERB 57		ENTR
b. Observe VERB 21	NOUN 01	Flashing
c. 00010		ENTR
d. Observe VERB 06	NOUN 01	Flashing
e. Observe PROG 07		Displayed

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB SEMI AUTOMATIC MODE SYSTEM

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SUBSYSTEM G & N SYSTEM

ASSY

6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error

b. TB4, 44(hi), 48(lo), MG AC D/A Error

c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE COSINE, TOTAL NULL

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

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JOB SEMI AUTOMATIC MODE TEST

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SUBSYSTEM G & N SYSTEM

ASSY

14. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe NO ATT lamp lights		
c. Observe VERB 06	NOUN 05	Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe NO ATT lamp lights		
c. Observe VERB 06	NOUN 12	Flashing after approx. 20 seconds

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator

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JOB SEMI AUTOMATIC MODE TEST

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SUBSYSTEM G & N SYSTEM

ASSY

Control panel will not light as specified.

23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY. The GIMBAL LOCK lamps on the DSKY and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe NO ATT lamp lights		
c. Observe VERB 06	NOUN 15	Flashing after approx. 20 seconds

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1Z resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV. E PAGE 1 OF 7 | INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-
Ⓜ D	11-17-66	31933	6	-	EA	-
E	1-12-67	32622	1, 6	-	EA	-

REFERENCES - PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Perform JDC 12215 to establish a Master Initialization condition.

1A. Press OPTICS POWER ON pushbutton on Test Control panel until pushbutton is lighted.

2. Perform the following DSKY operations:

a. VERB 57 ENTR

b. Observe VERB 21 NOUN 01 Flashing

c. 00010 ENTR

d. Observe VERB 06 NOUN 01 Flashing

e. Observe PROG 07 Displayed

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Sin AIG 1X resolver	144
b.	Sin AMG 1X resolver	143
c.	Sin AOG 1X resolver	142

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Sin AIG 1X resolver	144
b.	Sin AMG 1X resolver	143
c.	Sin AOG 1X resolver	142
d.	Cos AIG 1X resolver	243
e.	Cos AMG 1X resolver	242
f.	Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error

b. TB4, 44(hi), 48(lo), MG AC D/A Error

c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE COSINE, TOTAL NULL

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

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14. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe NO ATT lamp lights

c. Observe VERB 06 NOUN 05 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Cos AIG 1X resolver	243
b.	Cos AMG 1X resolver	242
c.	Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe NO ATT lamp lights

c. Observe VERB 06 NOUN 12 Flashing after approx. 20 seconds

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator

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Control panel will not light as specified.

23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY. The GIMBAL LOCK lamps on the DSKY and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe NO ATT lamp lights

c. Observe VERB 06 NOUN 15 Flashing after approx. 20 seconds

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Sin AIG 1X resolver	144
b.	Sin AMG 1X resolver	143
c.	Sin AOG 1X resolver	142
d.	Cos AIG 1Z resolver	243
e.	Cos AMG 1X resolver	242
f.	Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp

shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

-GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

33. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp lights
c. Observe
VERB 06 NOUN 17 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKY and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100 ENTR
b. Observe
VERB 22 NOUN 22 Flashing
c. +00100 ENTR
d. Observe
VERB 23 NOUN 22 Flashing
e. +00100 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

40. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds
d. +03375 ENTR
e. Observe
VERB 22 NOUN 22 Flashing
f. +03375 ENTR
g. Observe
VERB 23 NOUN 22 Flashing
h. +03375 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

42. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
NO ATT lamp lights

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d. Observe
VERB 06 NOUN 55 Flashing after approx. 20 seconds

44. Set the OPTICS MODE switch on the Indicator Control panel to MAN then to ZERO. Wait 15 seconds.

45. Set the OPTICS MODE switch to CGC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00

49. Press OPTICS POWER ON pushbutton on Test Control panel. The pushbutton shall go out.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC NO. 12216
REV. E
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ ____ CAL DATE
NAME ____ SER. NO. ____ ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv. rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	0.0		+11.0		
9.b	Sin AMG 1X	deg	0.0		+11.0		
9.c	Sin AOG 1X	deg	0.0		+11.0		
9.d	Cos AIG 1X	deg	0.0		+11.0		

shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

-GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

33. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe NO ATT lamp lights
c. Observe VERB 06 NOUN 17 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3of the DSKY.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe NO ATT lamp goes out
c. Observe VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKY and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100 ENTR
b. Observe VERB 22 NOUN 22 Flashing
c. +00100 ENTR
d. Observe VERB 23 NOUN 22 Flashing
e. +00100 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

40. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe ISS WARNING lamp goes out
c. Observe VERB 21 NOUN 22 Flashing after approx. 20 seconds
d. +03375 ENTR
e. Observe VERB 22 NOUN 22 Flashing
f. +03375 ENTR
g. Observe VERB 23 NOUN 22 Flashing
h. +03375 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

42. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe ISS WARNING lamp goes out
c. Observe NO ATT lamp lights

---

d. Observe VERB 06 NOUN 55 Flashing after approx. 20 seconds

44. Set the OPTICS MODE switch on the Indicator Control panel to MAN then to ZERO. Wait 15 seconds.

45. Set the OPTICS MODE switch to CGC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe PROG lamp indicates 00

49. Press OPTICS POWER ON pushbutton on Test Control panel. The pushbutton shall go out.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC NO. 12216
REV. E
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	0.0		+11.0		
9.b	Sin AMG 1X	deg	0.0		+11.0		
9.c	Sin AOG 1X	deg	0.0		+11.0		
9.d	Cos AIG 1X	deg	0.0		+11.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12216
REV. E

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	0.0		+11.0		
9.f	Cos AOG 1X	deg	0.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	-0.30		+0.30		
12.b	MG AC D/A Error	volts rms	-0.30		+0.30		
12.c	OG AC D/A Error	volts rms	-0.30		+0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12216
REV. E

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+180		+191		
29.b	Sin AMG 1X	deg	+180		+191		
29.c	Sin AOG 1X	deg	+180		+191		
29.d	Cos AIG 1X	deg	0		+11.0		
29.e	Cos AMG 1X	deg	0		+11.0		
29.f	Cos AOG 1X	deg	0		+11.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12216
REV. E

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
36	IG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
37	OG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
46	Shaft CDU rate	deg/sec	00006 32000	Row 1 Row 2	00008 32000		
47	TRUNNION CDU rate	deg/sec	00001 33000	Row 1 Row 2	00002 33000		
1, 2 3, 4 6, 7 14, 15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
REV. E

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12216
REV. E

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	0.0		+11.0		
9.f	Cos AOG 1X	deg	0.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	-0.30		+0.30		
12.b	MG AC D/A Error	volts rms	-0.30		+0.30		
12.c	OG AC D/A Error	volts rms	-0.30		+0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12216
REV. E

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+180		+191		
29.b	Sin AMG 1X	deg	+180		+191		
29.c	Sin AOG 1X	deg	+180		+191		
29.d	Cos AIG 1X	deg	0		+11.0		
29.e	Cos AMG 1X	deg	0		+11.0		
29.f	Cos AOG 1X	deg	0		+11.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12216
REV. E

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
36	IG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
37	OG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
46	Shaft CDU rate	deg/sec	00006 32000	Row 1 Row 2	00008 32000		
47	TRUNNION CDU rate	deg/sec	00001 33000	Row 1 Row 2	00002 33000		
1, 2 3, 4 6, 7 14, 15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
REV. E

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

DATE 30 JUN 66

JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV. F PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS. 5

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-
D	11-17-66	31933	6	-	EA	-
E	1-12-67	32622	1, 6	-	EA	-
F	5-4-67	33721	-	1, 2, 3	EA	-

REFERENCES - PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Perform JDC 12215 to establish a Master Initialization condition.

1A. Press OPTICS POWER ON pushbutton on Test Control panel until pushbutton is lighted.

2. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	Observe VERB 21	NOUN 01	Flashing
c.	00010		ENTR
d.	Observe VERB 06	NOUN 01	Flashing
e.	Observe PROG 07		Displayed

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Sin AIG 1X resolver	144
b.	Sin AMG 1X resolver	143
c.	Sin AOG 1X resolver	142

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Sin AIG 1X resolver	144
b.	Sin AMG 1X resolver	143
c.	Sin AOG 1X resolver	142
d.	Cos AIG 1X resolver	243
e.	Cos AMG 1X resolver	242
f.	Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error

b. TB4, 44(hi), 48(lo), MG AC D/A Error

c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE COSINE, TOTAL NULL

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

---

14. Perform the following DSKY operations:

a.	VERB 33		ENTR
b.	Observe NO ATT lamp lights		
c.	Observe VERB 06	NOUN 05	Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Cos AIG 1X resolver	243
b.	Cos AMG 1X resolver	242
c.	Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a.	VERB 33		ENTR"
b.	Observe NO ATT lamp lights		
c.	Observe VERB 06	NOUN 12	Flashing after approx. 20 seconds

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

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23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY. The GIMBAL LOCK lamps on the DSKY and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a.	VERB 33		ENTR
b.	Observe NO ATT lamp lights		
c.	Observe VERB 06	NOUN 15	Flashing after approx. 20 seconds

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Sin AIG 1X resolver	144
b.	Sin AMG 1X resolver	143
c.	Sin AOG 1X resolver	142
d.	Cos AIG 1Z resolver	243
e.	Cos AMG 1X resolver	242
f.	Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp

shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

-GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

33. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
NO ATT lamp lights

c. Observe
VERB 06 NOUN 17 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3of the DSKY.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
NO ATT lamp goes out

c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKY and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100 ENTR

b. Observe
VERB 22 NOUN 22 Flashing

c. +00100 ENTR

d. Observe
VERB 23 NOUN 22 Flashing

e. +00100 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

40. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
ISS WARNING lamp goes out

c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

d. +03375 ENTR

e. Observe
VERB 22 NOUN 22 Flashing

f. +03375 ENTR

g. Observe
VERB 23 NOUN 22 Flashing

h. +03375 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

42. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
ISS WARNING lamp goes out

c. Observe
NO ATT lamp lights

---

d. Observe
VERB 06 NOUN 55 Flashing after approx. 30 seconds

44. Set the OPTICS MODE switch on the Indicator Control panel to MAN then to ZERO. Wait 15 seconds.

45. Set the OPTICS MODE switch to CGC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34 ENTR

b. Observe
PROG lamp indicates 00

49. Press OPTICS POWER ON pushbutton on Test Control panel. The pushbutton shall go out.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC NO. 12216
REV. F
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ ____ CAL DATE
NAME ____ SER. NO. ____ ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	1.0		+11.0		
9.b	Sin AMG 1X	deg	1.0		+11.0		
9.c	Sin AOG 1X	deg	1.0		+11.0		
9.d	Cos AIG 1X	deg	1.0		+11.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12216
REV. F

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	1.0		+11.0		
9.f	Cos AOG 1X	deg	1.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	-0.30		+0.30		
12.b	MG AC D/A Error	volts rms	-0.30		+0.30		
12.c	OG AC D/A Error	volts rms	-0.30		+0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12216
REV. F

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+181		+191		
29.b	Sin AMG 1X	deg	+181		+191		
29.c	Sin AOG 1X	deg	+181		+191		
29.d	Cos AIG 1X	deg	1.0		+11.0		
29.e	Cos AMG 1X	deg	1.0		+11.0		
29.f	Cos AOG 1X	deg	1.0		+11.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12216
REV. F

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
36	IG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
37	OG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
46	Shaft CDU rate	deg/sec	00006 32000	Row 1 Row 2	00008 32000		
47	TRUNNION CDU rate	deg/sec	00001 33000	Row 1 Row 2	00002 33000		
1, 2 3, 4 6, 7 14, 15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
REV. F

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

DATE 30 JUN 66

JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV. G PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-
D	11-17-66	31933	6	-	EA	-
E	1-12-67	32622	1, 6	-	EA	-
F	5-4-67	33721	-	1,2,3	EA	-
G	6-6-67	33904	7	-	EA	-

REFERENCES -
PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Perform JDC 12215 to establish a Master Initialization condition.

1A. Press OPTICS POWER ON pushbutton on Test Control panel until pushbutton is lighted.

2. Perform the following DSKY operations:

a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00010 ENTR
d. Observe
VERB 06 NOUN 01 Flashing
e. Observe
PROG 07 Displayed

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0^0, are displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB SEMI AUTOMATIC MODE SYSTEM | JDC 12216 REV G PAGE 2 OF 7

SUBSYSTEM G & N SYSTEM | **ASSY**

6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error
b. TB4, 44(hi), 48(lo), MG AC D/A Error
c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE COSINE, TOTAL NULL

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV G PAGE 3 OF 7

SUBSYSTEM G & N SYSTEM | **ASSY**

14. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp lights
c. Observe
VERB 06 NOUN 05 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a. VERB 33 ENTR"
b. Observe
NO ATT lamp lights
c. Observe
VERB 06 NOUN 12 Flashing after approx. 20 seconds

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV G PAGE 4 OF 7

SUBSYSTEM G & N SYSTEM | **ASSY**

Control panel will not light as specified.

23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY. The GIMBAL LOCK lamps on the DSKY and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp lights
c. Observe
VERB 06 NOUN 15 Flashing after approx. 20 seconds

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1Z resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp

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shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

-GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

33. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp lights
c. Observe
VERB 06 NOUN 17 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3of the DSKY.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKY and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100 ENTR
b. Observe
VERB 22 NOUN 22 Flashing
c. +00100 ENTR
d. Observe
VERB 23 NOUN 22 Flashing
e. +00100 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

40. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds
d. +03375 ENTR
e. Observe
VERB 22 NOUN 22 Flashing
f. +03375 ENTR
g. Observe
VERB 23 NOUN 22 Flashing
h. +03375 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

42. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
NO ATT lamp lights

d. Observe
VERB 06 NOUN 55 Flashing after approx. 20 seconds

44. Set the OPTICS MODE switch on the Indicator Control panel to MAN then to ZERO. Wait 15 seconds.

45. Set the OPTICS MODE switch to CMC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00

49. Press OPTICS POWER ON pushbutton on Test Control panel. The pushbutton shall go out.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12216
REV. G
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ ____ CAL DATE
NAME ____ SER. NO. ____ ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	1.0		+11.0		
9.b	Sin AMG 1X	deg	1.0		+11.0		
9.c	Sin AOG 1X	deg	1.0		+11.0		
9.d	Cos AIG 1X	deg	1.0		+11.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC NO. 12216
REV. G

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	1.0		+11.0		
9.f	Cos AOG 1X	deg	1.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	-0.30		+0.30		
12.b	MG AC D/A Error	volts rms	-0.30		+0.30		
12.c	OG AC D/A Error	volts rms	-0.30		+0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC NO. 12216
REV. G

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+181		+191		
29.b	Sin AMG 1X	deg	+181		+191		
29.c	Sin AOG 1X	deg	+181		+191		
29.d	Cos AIG 1X	deg	1.0		+11.0		
29.e	Cos AMG 1X	deg	1.0		+11.0		
29.f	Cos AOG 1X	deg	1.0		+11.0		

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EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC NO. 12216
REV. G

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00012	Row 1	00016		
			00000	Row 2	00000		
36	IG CDU rate	deg/sec	00012	Row 1	00016		
			00000	Row 2	00000		
37	OG CDU rate	deg/sec	00012	Row 1	00016		
			00000	Row 2	00000		
46	Shaft CDU rate	deg/sec	00006	Row 1	00008		
			32000	Row 2	32000		
47	TRUNNION CDU rate	deg/sec	00001	Row 1	00002		
			33000	Row 2	33000		
1, 2 3, 4 6, 7 14, 15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC NO. 12216
REV. G

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

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JDC 12216 REV. H PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS 5

JOB SEMI AUTOMATIC MODE TEST

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-
D	11-17-66	31933	6	-	EA	-
E	1-12-67	32622	1, 6	-	EA	-
F	5-4-67	33721	-	1, 2, 3	EA	-
G	6-6-67	33904	7	-	EA	-
H	10-5-67	34807	7	-	EA	-

REFERENCES - PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Perform JDC 12215 to establish a Master Initialization condition.

1A. Press OPTICS POWER ON pushbutton on Test Control panel until pushbutton is lighted.

2. Perform the following DSKY operations:

a. VERB 57 ENTR

b. Observe VERB 21 NOUN 01 Flashing

c. 00010 ENTR

d. Observe VERB 06 NOUN 01 Flashing

e. Observe PROG 07 Displayed

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Sin AIG 1X resolver	144
b.	Sin AMG 1X resolver	143
c.	Sin AOG 1X resolver	142

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6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Sin AIG 1X resolver	144
b.	Sin AMG 1X resolver	143
c.	Sin AOG 1X resolver	142
d.	Cos AIG 1X resolver	243
e.	Cos AMG 1X resolver	242
f.	Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error

b. TB4, 44(hi), 48(lo), MG AC D/A Error

c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE COSINE, TOTAL NULL

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

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14. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe NO ATT lamp lights

c. Observe VERB 06 NOUN 05 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Cos AIG 1X resolver	243
b.	Cos AMG 1X resolver	242
c.	Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a. VERB 33 ENTR"

b. Observe NO ATT lamp lights

c. Observe VERB 06 NOUN 12 Flashing after approx. 20 seconds

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator

---

Control panel will not light as specified.

23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY. The GIMBAL LOCK lamps on the DSKY and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe NO ATT lamp lights

c. Observe VERB 06 NOUN 15 Flashing after approx. 20 seconds

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

	Signal	CROSSBAR CONTROL
a.	Sin AIG 1X resolver	144
b.	Sin AMG 1X resolver	143
c.	Sin AOG 1X resolver	142
d.	Cos AIG 1Z resolver	243
e.	Cos AMG 1X resolver	242
f.	Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp

shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

-GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

33. Perform the following DSKY operations:

a. VERB 33			ENTR
b. Observe NO ATT lamp lights			
c. Observe VERB 06	NOUN 17		Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3of the DSKY.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33			ENTR
b. Observe NO ATT lamp goes out			
c. Observe VERB 21	NOUN 22		Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKY and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100			ENTR
b. Observe VERB 22	NOUN 22		Flashing
c. +00100			ENTR
d. Observe VERB 23	NOUN 22		Flashing
e. +00100			ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

40. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33			ENTR
b. Observe ISS WARNING lamp goes out			
c. Observe VERB 21	NOUN 22		Flashing after approx. 20 seconds
d. +03375			ENTR
e. Observe VERB 22	NOUN 22		Flashing
f. +03375			ENTR
g. Observe VERB 23	NOUN 22		Flashing
h. +03375			ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

42. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33			ENTR
b. Observe ISS WARNING lamp goes out			
c. Observe NO ATT lamp lights			

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d. Observe VERB 06	NOUN 55		Flashing after approx. 20 seconds

NOTE: Step 44 applies to Indicator Control panel 2021290 only.

44. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to CMC.

NOTE: Step 45 applies to all Indicator Control panels except 2021290.

45. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to CMC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34			ENTR
b. Observe PROG lamp indicates 00			

49. Press OPTICS POWER ON pushbutton on Test Control panel. The pushbutton shall go out.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12216
REV. H
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE

NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	1.0		+11.0		
9.b	Sin AMG 1X	deg	1.0		+11.0		
9.c	Sin AOG 1X	deg	1.0		+11.0		
9.d	Cos AIG 1X	deg	1.0		+11.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12216
REV. H

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	1.0		+11.0		
9.f	Cos AOG 1X	deg	1.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	-0.30		+0.30		
12.b	MG AC D/A Error	volts rms	-0.30		+0.30		
12.c	OG AC D/A Error	volts rms	-0.30		+0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
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JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+181		+191		
29.b	Sin AMG 1X	deg	+181		+191		
29.c	Sin AOG 1X	deg	+181		+191		
29.d	Cos AIG 1X	deg	1.0		+11.0		
29.e	Cos AMG 1X	deg	1.0		+11.0		
29.f	Cos AOG 1X	deg	1.0		+11.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12216
REV. H

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
36	IG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
37	OG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
46	Shaft CDU rate	deg/sec	00006 32000	Row 1 Row 2	00008 32000		
47	TRUNNION CDU rate	deg/sec	00001 33000	Row 1 Row 2	00002 33000		
1, 2 3, 4 6, 7 14, 15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
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JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

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JOB SEMI AUTOMATIC MODE TEST

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INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-
D	11-17-66	31933	6	-	EA	-
E	1-12-67	32622	1, 6	-	EA	-
F	5-4-67	33721	-	1, 2, 3	EA	-
G	6-6-67	33904	7	-	EA	-
H	10-5-67	34807	7	-	EA	-
J	1-16-68	35446	1-3	2	EA	-

REFERENCES

PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Perform JDC 12215, excluding steps 16 and 17, to establish a Master Initialization condition.

1A. Press OPTICS POWER ON pushbutton on Test Control panel until pushbutton is lighted.

2. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	Observe VERB 21	NOUN 01	Flashing
c.	00010		ENTR
d.	Observe VERB 06	NOUN 01	Flashing
e.	Observe PROG 07		Displayed

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB SEMI AUTOMATIC MODE SYSTEM

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SUBSYSTEM G & N SYSTEM

ASSY

6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error

b. TB4, 44(hi), 48(lo), MG AC D/A Error

c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

+ GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

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JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV J PAGE 3 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

14. Perform the following DSKY operations:

a.	VERB 33		ENTR
b.	Observe NO ATT lamp lights		
c.	Observe VERB 06	NOUN 05	Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

TOTAL ATTITUDE COSINE, TOTAL NULL

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKY.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a.	VERB 33		ENTR"
b.	Observe NO ATT lamp lights		
c.	Observe VERB 06	NOUN 12	Flashing after approx. 20 seconds

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator

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JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV J PAGE 4 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

Control panel will not light as specified.

23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY. The GIMBAL LOCK lamps on the DSKY and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKY and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a.	VERB 33		ENTR
b.	Observe NO ATT lamp lights		
c.	Observe VERB 06	NOUN 15	Flashing after approx. 20 seconds

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1Z resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton and the TEST START pushbutton on the Test Selector panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton and the TEST STOP pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp

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shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

-GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

33. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp lights
c. Observe
VERB 06 NOUN 17 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3 of the DSKY.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

NOTE: When only one DSKY is available for testing the following conditions will occur:

a. With the DSKY in the NAV DSKY location the G/N CAUTION lamp on the Monitor panel will not light as specified.

b. With the DSKY in the MAIN DSKY location the PGNS lamp on the Indicator Control panel will not light as specified.

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKY and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100 ENTR
b. Observe
VERB 22 NOUN 22 Flashing
c. +00100 ENTR
d. Observe
VERB 23 NOUN 22 Flashing
e. +00100 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

40. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds
d. +03375 ENTR
e. Observe
VERB 22 NOUN 22 Flashing
f. +03375 ENTR
g. Observe
VERB 23 NOUN 22 Flashing
h. +03375 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing and the ISS WARNING lamp is lighted.

42. Row 1 of the DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
NO ATT lamp lights

---

d. Observe
VERB 06 NOUN 55 Flashing after approx. 20 seconds

NOTE: Step 44 applies to Indicator Control panel 2021290 only.

44. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to CMC.

NOTE: Step 45 applies to all Indicator Control panels except 2021290.

45. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to CMC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00

49. Press OPTICS POWER ON pushbutton on Test Control panel. The pushbutton shall go out.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC NO. 12216
REV. J
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	1.0		+11.0		
9.b	Sin AMG 1X	deg	1.0		+11.0		
9.c	Sin AOG 1X	deg	1.0		+11.0		
9.d	Cos AIG 1X	deg	1.0		+11.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12216
REV. J

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	1.0		+11.0		
9.f	Cos AOG 1X	deg	1.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	0		0.30		
12.b	MG AC D/A Error	volts rms	0		0.30		
12.c	OG AC D/A Error	volts rms	0		0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12216
REV. J

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+181		+191		
29.b	Sin AMG 1X	deg	+181		+191		
29.c	Sin AOG 1X	deg	+181		+191		
29.d	Cos AIG 1X	deg	1.0		+11.0		
29.e	Cos AMG 1X	deg	1.0		+11.0		
29.f	Cos AOG 1X	deg	1.0		+11.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12216
REV. J

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
36	IG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
37	OG CDU rate	deg/sec	00012 00000	Row 1 Row 2	00016 00000		
46	Shaft CDU rate	deg/sec	00006 32000	Row 1 Row 2	00008 32000		
47	TRUNNION CDU rate	deg/sec	00001 33000	Row 1 Row 2	00002 33000		
1, 2 3, 4 6, 7 14, 15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
REV. J

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV. K PAGE 1 OF 18
INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and attitude error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-
D	11-17-66	31933	6	-	EA	-
E	1-12-67	32622	1, 6	-	EA	-
F	5-4-67	33721	-	1, 2, 3	EA	-
G	6-6-67	33904	7	-	EA	-
H	10-5-67	34807	7	-	EA	-
J	1-16-68	35446	1-3	2	EA	-
K	8-26-68	36713	All	All	EA	-

REFERENCES - PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector before proceeding.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used.

Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM 00143A
Orig 3-18-66

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:

None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:

JDC 12216 CTS UPLINK Tape, P/N 2901649

NOTE: Prepare the CGC for the UPLINK code by establishing the following conditions on the CTS:

a. Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

b. Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

c. Set digitswitches on Self Test Assembly to 00000.

d. Self Test Panel - Press to light SELF TEST pushbutton.

e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape.

MANUAL LOAD PROCEDURES

1. Perform JDC 12215, excluding steps 16 and 17, to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

3. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 40266 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

f. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

g. RDC Interface panel - Press to light CH33-10 pushbutton.

h. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

i. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.

1. Perform JDC 12215, excluding steps 16 and 17, to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

3. Press EXECUTE pushbutton on Programmer and Monitor panel.

3A. When tape stops, observe that VERB 21 NOUN 01 flash on DSKY and then press

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MANUAL LOAD PROCEDURES

d. NOUN 15 ENTR
e. 61304 ENTR ENTR
f. 10000 ENTR ENTR
g. 01325 ENTR ENTR
h. 00023 ENTR ENTR
i. 01325 ENTR ENTR
j. 25546 ENTR ENTR
k. 31344 ENTR ENTR
l. 54324 ENTR ENTR
m. 41345 ENTR ENTR
n. 60150 ENTR ENTR
o. 10000 ENTR ENTR
p. 01332 ENTR ENTR
q. 00050 ENTR ENTR
r. 01332 ENTR ENTR
s. 37640 ENTR ENTR
t. 04451 ENTR ENTR
u. 01337 ENTR ENTR
v. 30005 ENTR ENTR
w. 02324 ENTR ENTR
x. 04505 ENTR ENTR
y. 31315 ENTR ENTR
z. 04451 ENTR ENTR
aa. 01300 ENTR ENTR
ab. 30005 ENTR ENTR
ac. 04505 ENTR ENTR
ad. 31315 ENTR ENTR
ae. 04451 ENTR ENTR
af. 01307 ENTR ENTR
ag. 30005 ENTR ENTR
ah. 04505 ENTR ENTR
ai. 31346 ENTR ENTR

CTS UPLINK TAPE LOAD PROCEDURES

EXECUTE pushbutton on Programmer and Monitor panel.

3B. When tape stops, observe that VERB 06 NOUN 01 flash on DSKY and that PROG 07 is displayed.

MANUAL LOAD PROCEDURES

aj.	54150		ENTR	ENTR
ak.	54331		ENTR	ENTR
al.	05572		ENTR	ENTR
am.	04505		ENTR	ENTR
an.	00002		ENTR	ENTR
ao.	30364		ENTR	ENTR
ap.	30376		ENTR	
aq.	VERB 25	NOUN 26	ENTR	
ar.	00001		ENTR	
as.	01300		ENTR	
at.	30005		ENTR	
au.	VERB 31		ENTR	
av.	VERB 57		ENTR	
aw.	Observe:			
	VERB 21	NOUN 01	Flashing	
ax.	00010		ENTR	
ay.	Observe:			
	VERB 06	NOUN 01	Flashing	
az.	Observe:			
	PROG 07		Displayed	

CDU ZERO

4. Enter VERB 33 and press ENTR pushbutton on DSKY. NO ATT lamp shall light. After approximately 20 seconds, VERB 06 NOUN 02 shall flash.

5. Observe the Gimbal angles, approximately 0.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

TOTAL ATTITUDE SINE IN-PHASE, TOTAL NULL

6. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1.

CTS UPLINK TAPE LOAD PROCEDURES

CDU ZERO

4. Press EXECUTE pushbutton on Programmer and Monitor panel. NO ATT lamp on DSKY shall light. After approximately 20 seconds, VERB 06 NOUN 02 shall flash.

5. Observe the Gimbal angles, approximately 0.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

TOTAL ATTITUDE SINE IN-PHASE, TOTAL NULL

6. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1.

MANUAL LOAD PROCEDURES

Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

7. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 03 shall flash. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3.

TOTAL ATTITUDE OUTPUTS

8. Set VOLTMETER INPUT switch on Primary Signal Selector panel to either PAVM SIG 1 or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each output specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test

CTS UPLINK TAPE LOAD PROCEDURES

Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

7. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 03 shall flash on DSKY. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3.

TOTAL ATTITUDE OUTPUTS

8. Set VOLTMETER INPUT switch on Primary Signal Selector panel to either PAVM SIG 1 or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each output specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test

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MANUAL LOAD PROCEDURES

Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

11. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.

IMU CDU AC D/A OUTPUTS

12. Set CROSSBAR CONTROL on Primary Signal Selector panel to 199. Connect buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB-4, 45 (high) and 49 (low), IG AC D/A error

b. TB-4, 44 (high) and 48 (low), MG AC D/A error

c. TB-4, 43 (high) and 47 (low), OG AC D/A error

CTS UPLINK TAPE LOAD PROCEDURES

Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

11. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.

IMU CDU AC D/A OUTPUTS

12. Set CROSSBAR CONTROL on Primary Signal Selector panel to 199. Connect buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB-4, 45 (high) and 49 (low), IG AC D/A error

b. TB-4, 44 (high) and 48 (low), MG AC D/A error

c. TB-4, 43 (high) and 47 (low), OG AC D/A error

MANUAL LOAD PROCEDURES

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press ENTR pushbutton on DSKY. NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

+ GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 14:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

14. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:
NO ATT lamp lights

c. Observe:
VERB 06 NOUN 05 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator Control panel, and G/N CAUTION lamp on Monitor panel shall light.

CTS UPLINK TAPE LOAD PROCEDURES

CDU REPEATING ACCURACY 45°

13. Press EXECUTE pushbutton on Programmer and Monitor panel. NO ATT lamp on DSKY shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

+ GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 14:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

14. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 05 flash. The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator Control panel, and G/N CAUTION lamp on Monitor panel shall light.

MANUAL LOAD PROCEDURES

TOTAL ATTITUDE COSINE, TOTAL NULL

15. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 06 shall flash.

16. Observe the Gimbal angles, approximately 90.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

17. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY 135°

18. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 07 shall flash. Record Gimbal angles displayed in Row 1, Row 2, and Row 3.

19. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 10 shall flash. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe Gimbal angles, approximately 135°, 135°, and 45° respectively, are displayed in Row 1, Row 2, and Row 3 of the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TOTAL ATTITUDE COSINE, TOTAL NULL

15. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 06 shall flash on DSKY.

16. Observe the Gimbal angles, approximately 90.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

17. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY 135°

18. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 07 shall flash on DSKY. Record Gimbal angles displayed in Row 1, Row 2, and Row 3.

19. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 10 shall flash on DSKY. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe Gimbal angles, approximately 135°, 135°, and 45° respectively, are displayed in Row 1, Row 2, and Row 3 of the DSKY.

MANUAL LOAD PROCEDURES

CDU REPEATING ACCURACY 135°

20. Enter VERB 33 and press ENTR pushbutton on DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

CDU COMMAND ACCURACY 225°

21. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:

NO ATT lamp lights

c. Observe:

VERB 06 NOUN 12 Flashing after approx. 20 seconds

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 22:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

22. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY. The

CTS UPLINK TAPE LOAD PROCEDURES

CDU REPEATING ACCURACY 135°

20. Press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on the DSKY shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

CDU COMMAND ACCURACY 225°

21. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 12 flash.

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 22:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

22. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY. The

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MANUAL LOAD PROCEDURES

GIMBAL LOCK lamps on DSKY and Monitor panel, the G/N CAUTION lamp on Monitor panel, and the PGNS lamp on Indicator Control panel shall be lighted.

23. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 13 shall flash. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe the Gimbal angles, approximately 225°, 225°, and 315° respectively, are displayed in Rows 1, 2, and 3 of the DSKY.

CDU REPEATING ACCURACY 225°

24. Enter VERB 33 and press ENTR pushbutton on DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 06 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

TOTAL ATTITUDE OUTPUTS 315°

25. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:

NO ATT lamp lights

c. Observe:

VERB 06 NOUN 15 Flashing after approx. 20 seconds

26. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY.

27. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1

CTS UPLINK TAPE LOAD PROCEDURES

GIMBAL LOCK lamps on DSKY and Monitor panel, the G/N CAUTION lamp on Monitor panel, and the PGNS lamp on Indicator Control panel shall be lighted.

23. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 13 shall flash on DSKY. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe the Gimbal angles, approximately 225°, 225°, and 315° respectively, are displayed on Rows 1, 2, and 3 of the DSKY.

CDU REPEATING ACCURACY 225°

24. Press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall go out. after approximately 100 seconds, VERB 06 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

TOTAL ATTITUDE OUTPUTS 315°

25. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 15 flash.

26. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY.

27. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1

MANUAL LOAD PROCEDURES

or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

28. Measure and record the phase angle of each output specified in step 27.

29. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

CTS UPLINK TAPE LOAD PROCEDURES

or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

28. Measure and record the phase angle of each output specified in step 27.

29. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
30. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.	30. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.
CDU REPEATING ACCURACY 315°	CDU REPEATING ACCURACY 315°
31. Enter VERB 33 and press ENTR pushbutton on DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.	31. Press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.
- GIMBAL LOCK TEST	- GIMBAL LOCK TEST
NOTE: When only one DSKY is available for testing, the following conditions will occur in step 32: a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified. b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.	NOTE: When only one DSKY is available for testing, the following conditions will occur in step 32: a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified. b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.
32. Perform following DSKY operations: a. VERB 33 ENTR b. Observe: NO ATT lamp lights c. Observe: VERB 06 NOUN 17 Flashing after approx. 20 seconds	32. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 17 flash. The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator panel, and G/N CAUTION lamp on Monitor panel shall light.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator Control panel, and G/N CAUTION lamp on Monitor panel shall light.	
33. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 20 shall flash. Insure that Row 1, Row 2, and Row 3 display approximately 0°.	33. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 20 shall flash on DSKY. Insure that Row 1, Row 2, and Row 3 display approximately 0°.
NOTE: When only one DSKY is available for testing, the following conditions will occur in step 34: a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified. b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.	NOTE: When only one DSKY is available for testing, the following conditions will occur in step 34: a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified. b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.
34. Enter VERB 33 and press ENTR pushbutton on DSKY. Observe that COMP ACTY lamp flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications (MG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel, the PGNS lamp on Indicator Control panel, and the G/N CAUTION lamp on Monitor panel shall light.	34. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that COMP ACTY lamp flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications (MG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel, the PGNS lamp on Indicator panel, and the G/N CAUTION lamp on Monitor panel shall light.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
35. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash. Record Row 1 and Row 2 indications (IG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted.	35. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash on DSKY. Record Row 1 and Row 2 indications (IG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted.
36. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash. Record Row 1 and Row 2 indications (OG CDU rate).	36. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash on DSKY. Record Row 1 and Row 2 indications (OG CDU rate).
IMU CDU FINE FAIL TEST	IMU CDU FINE FAIL TEST
37. Perform following DSKY operations: a. VERB 33 ENTR b. Observe: NO ATT lamp goes out c. Observe: VERB 21 NOUN 22 Flashing after approx. 20 seconds Observe the GIMBAL LOCK lamps on DSKY and Monitor panel are not lighted.	37. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY goes out. After approximately 20 seconds, observe that VERB 21 NOUN 22 flash. Observe GIMBAL LOCK lamps on DSKY and Monitor panel are not lighted.
38. Perform following DSKY operations: a. +00100 ENTR b. Observe: VERB 22 NOUN 22 Flashing d. +00100 ENTR d. Observe: VERB 23 NOUN 22 Flashing e. +00100 ENTR The NO ATT lamp shall light momentarily and then go out. After approximately 100	38. Press EXECUTE pushbutton on Programmer and Monitor panel. 38A. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 38B. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall light momentarily and then go out. After approximately 100 seconds,

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
seconds, VERB 01 NOUN 10 shall flash and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.	VERB 01 NOUN 10 shall flash on DSKY and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.
IMU CDU COARSE FAIL TEST	IMU CDU COARSE FAIL TEST
39. Perform following DSKY operations: a. VERB 25 NOUN 26 ENTR b. 00001 ENTR c. 01300 ENTR d. 30005 ENTR e. VERB 31 ENTR f. VERB 33 ENTR g. Observe: ISS lamp on Indicator Control panel goes out h. Observe: VERB 21 NOUN 22 Flashing after approx. 20 seconds i. +03375 ENTR j. Observe: VERB 22 NOUN 22 Flashing k. +03375 ENTR l. Observe: VERB 23 NOUN 22 Flashing m. +03375 ENTR The NO ATT lamp shall light momentarily and then go out. After approximately 90 seconds, VERB 01 NOUN 10 shall flash and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.	39. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that ISS lamp on Indicator Control panel goes out. 39A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 39B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 39C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall light momentarily and then go out. After approximately 90 seconds, VERB 01 NOUN 10 shall flash on DSKY and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
OPTICS RATE TEST	OPTICS RATE TEST
40. Perform following DSKY operations: a. VERB 33 ENTR b. Observe: ISS lamp on Indicator Control panel goes out c. Observe: NO ATT lamp lights d. Observe: VERB 06 NOUN 55 Flashing after approx. 20 seconds	40. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that ISS lamp on Indicator Control panel goes out. Observe NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 55 flash.
41. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the Trunnion TPAC. NOTE: Step 42 applies to Indicator Control panel 2021290 only.	41. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the Trunnion TPAC. NOTE: Step 42 applies to Indicator Control panel 2021290 only.
42. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to MAN. NOTE: Step 43 applies to all Indicator Control panels except 2021290.	42. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to MAN. NOTE: Step 43 applies to all Indicator Control panels except 2021290.
43. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.	43. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.
44. Using Optics Hand Controller, drive the Optics Shaft until the SHAFT TPAC indicates approximately +5 degrees.	44. Using Optics Hand Controller, drive the Optics Shaft until the SHAFT TPAC indicates approximately +5 degrees.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
45. Set OPTICS MODE switch to CMC.	45. Set OPTICS MODE switch to CMC.
SHAFT RATE TEST	SHAFT RATE TEST
46. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 25 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.	46. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 25 seconds, VERB 06 NOUN 66 shall flash on DSKY. Record Row 1 and Row 2 indications.
TRUNNION RATE TEST	TRUNNION RATE TEST
47. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 15 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.	47. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 15 seconds, VERB 06 NOUN 66 shall flash on DSKY. Record Row 1 and Row 2 indications.
48. Enter VERB 34 and press ENTR pushbutton on DSKY. Observe PROG display indicates 00.	48. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe PROG display on DSKY indicates 00.
49. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.	49. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.
	50. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.
	51. Press to extinguish CH33-10 pushbutton on RDC Interface panel.
	52. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press to light MONITOR pushbutton. AGC INPUT-CTR pushbutton shall go out.
	53. Set Power switch on Tape Reader to OFF and remove tape.
	54. Press to extinguish SELF TEST pushbutton on Self Test panel.
	55. Remove Self Test Assembly and Buffer Box Assembly from CTS.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12216
REV. K
INITIAL TDRR 29182

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL. DATE
NAME ____ SER. NO. ____ CAL. DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
6.a	Sine AIG 1X Total	mv. rms	0		150		
6.b	Sine AMG 1X Total	mv rms	0		150		
6.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X	v rms	16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	1.0		+11.0		
9.b	Sin AMG 1X	deg	1.0		+11.0		
9.c	Sin AOG 1X	deg	1.0		+11.0		
9.d	Cos AIG 1X	deg	1.0		+11.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12216
REV K

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	1.0		+11.0		
9.f	Cos AOG 1X	deg	1.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	0		0.30		
12.b	MG AC D/A Error	volts rms	0		0.30		
12.c	OG AC D/A Error	volts rms	0		0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
18	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
20	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12216
REV. K

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
22	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
24	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
26	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
27.a	Sin AIG 1X	volts rms	-16.54		-20.22		
27.b	Sin AMG 1X	volts rms	-16.54		-20.22		
27.c	Sin AOG 1X	volts rms	-16.54		-20.22		
27.d	Cos AIG 1X	volts rms	+16.54		+20.22		
27.e	Cos AMG 1X	volts rms	+16.54		+20.22		
27.f	Cos AOG 1X	volts rms	+16.54		+20.22		
28.a	Sin AIG 1X	deg	+181		+191		
28.b	Sin AMG 1X	deg	+181		+191		
28.c	Sin AOG 1X	deg	+181		+191		
28.d	Cos AIG 1X	deg	1.0		+11.0		
28.e	Cos AMG 1X	deg	1.0		+11.0		
28.f	Cos AOG 1X	deg	1.0		+11.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12216
REV. K

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29.a	Sin AIG	v rms	-15.64		-19.12		
29.b	Cos AIG	v rms	+15.64		+19.12		
29.c	Sin AMG	v rms	-15.64		-19.12		
29.d	Cos AMG	v rms	+15.64		+19.12		
29.e	Sin AOG	v rms	-15.64		-19.12		
29.f	Cos AOG	v rms	+15.64		+19.12		
31	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
34	MG CDU rate	deg/sec	00012 .00000	Row 1 ( ) _____ Row 2 ( )._____	00016 .00000		
35	IG CDU rate	deg/sec	00012 .00000	Row 1 ( ) _____ Row 2 ( )._____	00016 .00000		
36	OG CDU rate	deg/sec	00012 .00000	Row 1 ( ) _____ Row 2 ( )._____	00016 .00000		
46	Shaft CDU rate	deg/sec	00005 .49000	Row 1 ( ) _____ Row 2 ( )._____	00009 .15000		
47	TRUNNION CDU rate	deg/sec	00001 .38000	Row 1 ( ) _____ Row 2 ( )._____	00002 .28000		
1, 2 3, 4, 5, 7 14, 15 16, 18 19, 20 21, 22 23, 25 26, 32	Displays and Lamps			Reacted as specified			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
REV. K

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
33, 37, 38, 39, 40, 48	Displays and Lamps (cont)			Reacted as specified			

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JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV. L PAGE 1 OF 20
INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and attitude error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-
D	11-17-66	31933	6	-	EA	-
E	1-12-67	32622	1, 6	-	EA	-
F	5-4-67	33721	-	1, 2, 3	EA	-
G	6-6-67	33904	7	-	EA	-
H	10-5-67	34807	7	-	EA	-
J	1-16-68	35446	1-3	2	EA	-
K	8-26-68	36713	All	All	EA	-
L	3-11-69	37406	2, 18	-	EA	-

REFERENCES - PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector before proceeding.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used.

Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM (0143) Chg 3-18-66

JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV L PAGE 2 OF 20

SUBSYSTEM G & N SYSTEM
ASSY

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:

None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:

JDC 12216 CTS UPLINK Tape, P/N 2901649-002

NOTE: Prepare the CGC for the UPLINK code by establishing the following conditions on the CTS:

a. Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.
b. Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.
c. Set digitswitches on Self Test Assembly to 00000.
d. Self Test Panel - Press to light SELF TEST pushbutton.
e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape.

DATE 30 JUN 66

JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV L PAGE 3 OF 20

SUBSYSTEM G & N SYSTEM
ASSY

MANUAL LOAD PROCEDURES

1. Perform JDC 12215, excluding steps 16 and 17, to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

3. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 40266 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

f. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.
g. RDC Interface panel - Press to light CH33-10 pushbutton.
h. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.
i. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.

1. Perform JDC 12215, excluding steps 16 and 17, to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

3. Press EXECUTE pushbutton on Programmer and Monitor panel.

3A. When tape stops, observe that VERB 21 NOUN 01 flash on DSKY and then press

DATE 30 JUN 66

JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV L PAGE 4 OF 20

SUBSYSTEM G & N SYSTEM
ASSY

MANUAL LOAD PROCEDURES

d.	NOUN 15	ENTR	
e.	61304	ENTR	ENTR
f.	10000	ENTR	ENTR
g.	01325	ENTR	ENTR
h.	00023	ENTR	ENTR
i.	01325	ENTR	ENTR
j.	25546	ENTR	ENTR
k.	31344	ENTR	ENTR
l.	54324	ENTR	ENTR
m.	41345	ENTR	ENTR
n.	60150	ENTR	ENTR
o.	10000	ENTR	ENTR
p.	01332	ENTR	ENTR
q.	00050	ENTR	ENTR
r.	01332	ENTR	ENTR
s.	37640	ENTR	ENTR
t.	04451	ENTR	ENTR
u.	01337	ENTR	ENTR
v.	30005	ENTR	ENTR
w.	02324	ENTR	ENTR
x.	04505	ENTR	ENTR
y.	31315	ENTR	ENTR
z.	04451	ENTR	ENTR
aa.	01300	ENTR	ENTR
ab.	30005	ENTR	ENTR
ac.	04505	ENTR	ENTR
ad.	31315	ENTR	ENTR
ae.	04451	ENTR	ENTR
af.	01307	ENTR	ENTR
ag.	30005	ENTR	ENTR
ah.	04505	ENTR	ENTR
ai.	31346	ENTR	ENTR

CTS UPLINK TAPE LOAD PROCEDURES

EXECUTE pushbutton on Programmer and Monitor panel.

3B. When tape stops, observe that VERB 06 NOUN 01 flash on DSKY and that PROG 07 is displayed.

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MANUAL LOAD PROCEDURES

aj.	54150		ENTR	ENTR
ak.	54331		ENTR	ENTR
al.	05572		ENTR	ENTR
am.	04505		ENTR	ENTR
an.	00002		ENTR	ENTR
ao.	30364		ENTR	ENTR
ap.	30376		ENTR	
aq.	VERB 25	NOUN 26	ENTR	
ar.	00001		ENTR	
as.	01300		ENTR	
at.	30005		ENTR	
au.	VERB 31		ENTR	
av.	VERB 57		ENTR	
aw.	Observe:			
	VERB 21	NOUN 01	Flashing	
ax.	00010		ENTR	
ay.	Observe:			
	VERB 06	NOUN 01	Flashing	
az.	Observe:			
	PROG 07		Displayed	

CDU ZERO

4. Enter VERB 33 and press ENTR pushbutton on DSKY. NO ATT lamp shall light. After approximately 20 seconds, VERB 06 NOUN 02 shall flash.

5. Observe the Gimbal angles, approximately 0.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

TOTAL ATTITUDE SINE IN-PHASE, TOTAL NULL

6. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1.

CTS UPLINK TAPE LOAD PROCEDURES

CDU ZERO

4. Press EXECUTE pushbutton on Programmer and Monitor panel. NO ATT lamp on DSKY shall light. After approximately 20 seconds, VERB 06 NOUN 02 shall flash.

5. Observe the Gimbal angles, approximately 0.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

TOTAL ATTITUDE SINE IN-PHASE, TOTAL NULL

6. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1.

MANUAL LOAD PROCEDURES

Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

7. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 03 shall flash. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3.

TOTAL ATTITUDE OUTPUTS

8. Set VOLTMETER INPUT switch on Primary Signal Selector panel to either PAVM SIG 1 or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each output specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test

CTS UPLINK TAPE LOAD PROCEDURES

Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

7. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 03 shall flash on DSKY. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3.

TOTAL ATTITUDE OUTPUTS

8. Set VOLTMETER INPUT switch on Primary Signal Selector panel to either PAVM SIG 1 or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each output specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test

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MANUAL LOAD PROCEDURES

Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

11. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.

IMU CDU AC D/A OUTPUTS

12. Set CROSSBAR CONTROL on Primary Signal Selector panel to 199. Connect buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB-4, 45 (high) and 49 (low), IG AC D/A error
b. TB-4, 44 (high) and 48 (low), MG AC D/A error
c. TB-4, 43 (high) and 47 (low), OG AC D/A error

CTS UPLINK TAPE LOAD PROCEDURES

Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

11. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.

IMU CDU AC D/A OUTPUTS

12. Set CROSSBAR CONTROL on Primary Signal Selector panel to 199. Connect buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB-4, 45 (high) and 49 (low), IG AC D/A error
b. TB-4, 44 (high) and 48 (low), MG AC D/A error
c. TB-4, 43 (high) and 47 (low), OG AC D/A error

MANUAL LOAD PROCEDURES

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press ENTR pushbutton on DSKY. NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

+ GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 14:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.
b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

14. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
NO ATT lamp lights
c. Observe:
VERB 06 NOUN 05 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator Control panel, and G/N CAUTION lamp on Monitor panel shall light.

CTS UPLINK TAPE LOAD PROCEDURES

CDU REPEATING ACCURACY 45°

13. Press EXECUTE pushbutton on Programmer and Monitor panel. NO ATT lamp on DSKY shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

+ GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 14:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.
b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

14. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 05 flash. The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator Control panel, and G/N CAUTION lamp on Monitor panel shall light.

MANUAL LOAD PROCEDURES

TOTAL ATTITUDE COSINE, TOTAL NULL

15. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 06 shall flash.

16. Observe the Gimbal angles, approximately 90.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

17. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY 135°

18. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 07 shall flash. Record Gimbal angles displayed in Row 1, Row 2, and Row 3.

19. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 10 shall flash. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe Gimbal angles, approximately 135°, 135°, and 45° respectively, are displayed in Row 1, Row 2, and Row 3 of the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TOTAL ATTITUDE COSINE, TOTAL NULL

15. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 06 shall flash on DSKY.

16. Observe the Gimbal angles, approximately 90.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

17. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY 135°

18. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 07 shall flash on DSKY. Record Gimbal angles displayed in Row 1, Row 2, and Row 3.

19. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 10 shall flash on DSKY. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe Gimbal angles, approximately 135°, 135°, and 45° respectively, are displayed in Row 1, Row 2, and Row 3 of the DSKY.

MANUAL LOAD PROCEDURES

CDU REPEATING ACCURACY 135°

20. Enter VERB 33 and press ENTR pushbutton on DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

CDU COMMAND ACCURACY 225°

21. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:
NO ATT lamp lights

c. Observe:
VERB 06 NOUN 12 Flashing after approx. 20 seconds

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 22:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

22. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY. The

CTS UPLINK TAPE LOAD PROCEDURES

CDU REPEATING ACCURACY 135°

20. Press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on the DSKY shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

CDU COMMAND ACCURACY 225°

21. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 12 flash.

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 22:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

22. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY. The

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MANUAL LOAD PROCEDURES

GIMBAL LOCK lamps on DSKY and Monitor panel, the G/N CAUTION lamp on Monitor panel, and the PGNS lamp on Indicator Control panel shall be lighted.

23. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 13 shall flash. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe the Gimbal angles, approximately 225°, 225°, and 315° respectively, are displayed in Rows 1, 2, and 3 of the DSKY.

CDU REPEATING ACCURACY 225°

24. Enter VERB 33 and press ENTR pushbutton on DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

TOTAL ATTITUDE OUTPUTS 315°

25. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:
NO ATT lamp lights

c. Observe:
VERB 06 NOUN 15 Flashing after approx. 20 seconds

26. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY.

27. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1

CTS UPLINK TAPE LOAD PROCEDURES

GIMBAL LOCK lamps on DSKY and Monitor panel, the G/N CAUTION lamp on Monitor panel, and the PGNS lamp on Indicator Control panel shall be lighted.

23. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 13 shall flash on DSKY. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe the Gimbal angles, approximately 225°, 225°, and 315° respectively, are displayed on Rows 1, 2, and 3 of the DSKY.

CDU REPEATING ACCURACY 225°

24. Press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall go out. after approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

TOTAL ATTITUDE OUTPUTS 315°

25. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 15 flash.

26. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY.

27. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1

MANUAL LOAD PROCEDURES

or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

28. Measure and record the phase angle of each output specified in step 27.

29. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

CTS UPLINK TAPE LOAD PROCEDURES

or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

28. Measure and record the phase angle of each output specified in step 27.

29. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
30. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.	30. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.
CDU REPEATING ACCURACY 315°	CDU REPEATING ACCURACY 315°
31. Enter VERB 33 and press ENTR pushbutton on DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.	31. Press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.
- GIMBAL LOCK TEST	- GIMBAL LOCK TEST
NOTE: When only one DSKY is available for testing, the following conditions will occur in step 32: a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified. b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.	NOTE: When only one DSKY is available for testing, the following conditions will occur in step 32: a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified. b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.
32. Perform following DSKY operations: a. VERB 33 ENTR b. Observe: NO ATT lamp lights c. Observe: VERB 06 NOUN 17 Flashing after approx. 20 seconds	32. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 17 flash. The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator panel, and G/N CAUTION lamp on Monitor panel shall light.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator Control panel, and G/N CAUTION lamp on Monitor panel shall light.	
33. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 20 shall flash. Insure that Row 1, Row 2, and Row 3 display approximately 0°.	33. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 20 shall flash on DSKY. Insure that Row 1, Row 2, and Row 3 display approximately 0°.
NOTE: When only one DSKY is available for testing, the following conditions will occur in step 34: a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified. b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.	NOTE: When only one DSKY is available for testing, the following conditions will occur in step 34: a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified. b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.
34. Enter VERB 33 and press ENTR pushbutton on DSKY. Observe that COMP ACTY lamp flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications (MG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel, the PGNS lamp on Indicator Control panel, and the G/N CAUTION lamp on Monitor panel shall light.	34. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that COMP ACTY lamp flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications (MG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel, the PGNS lamp on Indicator panel, and the G/N CAUTION lamp on Monitor panel shall light.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
35. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash. Record Row 1 and Row 2 indications (IG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted.	35. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash on DSKY. Record Row 1 and Row 2 indications (IG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted.
36. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash. Record Row 1 and Row 2 indications (OG CDU rate).	36. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash on DSKY. Record Row 1 and Row 2 indications (OG CDU rate).
IMU CDU FINE FAIL TEST	IMU CDU FINE FAIL TEST
37. Perform following DSKY operations: a. VERB 33 ENTR b. Observe: NO ATT lamp goes out c. Observe: VERB 21 NOUN 22 Flashing after approx. 20 seconds Observe the GIMBAL LOCK lamps on DSKY and Monitor panel are not lighted.	37. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY goes out. After approximately 20 seconds, observe that VERB 21 NOUN 22 flash. Observe GIMBAL LOCK lamps on DSKY and Monitor panel are not lighted.
38. Perform following DSKY operations: a. +00100 ENTR b. Observe: VERB 22 NOUN 22 Flashing d. +00100 ENTR d. Observe: VERB 23 NOUN 22 Flashing e. +00100 ENTR The NO ATT lamp shall light momentarily and then go out. After approximately 100	38. Press EXECUTE pushbutton on Programmer and Monitor panel. 38A. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 38B. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall light momentarily and then go out. After approximately 100 seconds,

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
seconds, VERB 01 NOUN 10 shall flash and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.	VERB 01 NOUN 10 shall flash on DSKY and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.
IMU CDU COARSE FAIL TEST	IMU CDU COARSE FAIL TEST
39. Perform following DSKY operations: a. VERB 25 NOUN 26 ENTR b. 00001 ENTR c. 01300 ENTR d. 30005 ENTR e. VERB 31 ENTR f. VERB 33 ENTR g. Observe: ISS lamp on Indicator Control panel goes out h. Observe: VERB 21 NOUN 22 Flashing after approx. 20 seconds i. +03375 ENTR j. Observe: VERB 22 NOUN 22 Flashing k. +03375 ENTR l. Observe: VERB 23 NOUN 22 Flashing m. +03375 ENTR The NO ATT lamp shall light momentarily and then go out. After approximately 90 seconds, VERB 01 NOUN 10 shall flash and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.	39. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that ISS lamp on Indicator Control panel goes out. 39A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 39B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 39C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall light momentarily and then go out. After approximately 90 seconds, VERB 01 NOUN 10 shall flash on DSKY and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV L PAGE 17 OF 20

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

OPTICS RATE TEST

40. Perform following DSKY operations:
- a. VERB 33 ENTR
- b. Observe:
  ISS lamp on Indicator Control panel goes out
- c. Observe:
  NO ATT lamp lights
- d. Observe:
  VERB 06 NOUN 55 Flashing after approx. 20 seconds

41. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 42 applies to Indicator Control panel 2021290 only.

42. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to MAN.

NOTE: Step 43 applies to all Indicator Control panels except 2021290.

43. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

44. Using Optics Hand Controller, drive the Optics Shaft until the SHAFT TPAC indicates approximately +5 degrees.

CTS UPLINK TAPE LOAD PROCEDURES

OPTICS RATE TEST

40. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that ISS lamp on Indicator Control panel goes out. Observe NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 55 flash.

41. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 42 applies to Indicator Control panel 2021290 only.

42. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to MAN.

NOTE: Step 43 applies to all Indicator Control panels except 2021290.

43. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

44. Using Optics Hand Controller, drive the Optics Shaft until the SHAFT TPAC indicates approximately +5 degrees.

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV L PAGE 18 OF 20

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

45. Set OPTICS MODE switch to CMC.

SHAFT RATE TEST

46. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 25 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications

TRUNNION RATE TEST

47. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 15 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

48. Enter VERB 34 and press ENTR pushbutton on DSKY. Observe PROG display indicates 00.

OPTICS CDU FAIL TEST

49. Set OPTICS MODE switch on Indicator Control panel to MAN.

50. Perform following DSKY operations:
- a. VERB 21 NOUN 10 ENTR
- b. 00012 ENTR
- c. 00000 ENTR

51. Using Optics Hand Controller on Indicator Control panel, drive optics until SHAFT TPAC indicates 1.65 (±0.15) degrees and TRUNNION TPAC indicates 0.00 degrees. Set OPTICS SPEED switch to HI and LO as required.

CTS UPLINK TAPE LOAD PROCEDURES

45. Set OPTICS MODE switch to CMC.

SHAFT RATE TEST

46. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 25 seconds, VERB 06 NOUN 66 shall flash on DSKY. Record Row 1 and Row 2 indications.

TRUNNION RATE TEST

47. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 15 seconds, VERB 06 NOUN 66 shall flash on DSKY. Record Row 1 and Row 2 indications.

48. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe PROG display on DSKY indicates 00.

OPTICS CDU FAIL TEST

49. Set OPTICS MODE switch on Indicator Control panel to MAN.

50. Press EXECUTE pushbutton on Programmer and Monitor panel.

51. Using Optics Hand Controller on Indicator Control panel, drive optics until SHAFT TPAC indicates 1.65 (±0.15) degrees and TRUNNION TPAC indicates 0.00 (±0.10) degrees. Set OPTICS SPEED switch to HI and LO as required.

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV L PAGE 19 OF 20

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

52. Perform following DSKY operations:
- a. VERB 21 NOUN 10 ENTR
- b. 00012 ENTR
- c. 00001 ENTR
- d. Observe:
  TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel light.

53. Perform following DSKY operations:
- a. VERB 21 NOUN 10 ENTR
- b. 00012 ENTR
- c. 00000 ENTR
- d. Press RSET
- e. Observe:
  TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel go out.

54. Using Optics Hand Controller on Indicator Control panel, drive optics until SHAFT TPAC indicates 0.00 degrees and TRUNNION TPAC indicates 0.85 (±0.10) degrees.

55. Perform following DSKY operations:
- a. VERB 21 NOUN 10 ENTR
- b. 00012 ENTR
- c. 00001 ENTR
- d. Observe:
  TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel light.

CTS UPLINK TAPE LOAD PROCEDURES

52. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, observe that TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel light.

53. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, observe that TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel go out.

54. Using Optics Hand Controller on Indicator Control panel, drive optics until SHAFT TPAC indicates 0.00 (±0.15) degrees and TRUNNION TPAC indicates 0.85 (±0.10) degrees.

55. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, observe that TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel light.

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV L PAGE 20 OF 20

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

56. Perform following DSKY operations:
- a. VERB 21 NOUN 10 ENTR
- b. 00012 ENTR
- c. 00000 ENTR
- d. Press RSET
- e. Observe:
  TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel go out.

57. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

CTS UPLINK TAPE LOAD PROCEDURES

56. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, observe that TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel go out.

57. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

58. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

59. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

60. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press to light MONITOR pushbutton. AGC INPUT-CTR pushbutton shall go out.

61. Rewind and remove tape from Tape Reader and set Power switch to OFF.

62. Press to extinguish SELF TEST pushbutton on Self Test panel.

63. Remove Self Test Assembly from Buffer Box Assembly.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 5

JDC
NO. 12216
REV. L
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ________ CAL DATE

NAME ____________ SER. NO. ________ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
6.a	Sine AIG 1X Total	mv rms	0		150		
6.b	Sine AMG 1X Total	mv rms	0		150		
6.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X	v rms	16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	1.0		+11.0		
9.b	Sin AMG 1X	deg	1.0		+11.0		
9.c	Sin AOG 1X	deg	1.0		+11.0		
9.d	Cos AIG 1X	deg	1.0		+11.0		

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EQUIPMENT TEST
DATA SHEET 2 **OF** 5

JDC
NO. 12216
REV. L

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	1.0		+11.0		
9.f	Cos AOG 1X	deg	1.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	0		0.30		
12.b	MG AC D/A Error	volts rms	0		0.30		
12.c	OG AC D/A Error	volts rms	0		0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
18	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
20	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

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EQUIPMENT TEST
DATA SHEET 3 **OF** 5

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JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
22	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
24	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
26	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
27.a	Sin AIG 1X	volts rms	-16.54		-20.22		
27.b	Sin AMG 1X	volts rms	-16.54		-20.22		
27.c	Sin AOG 1X	volts rms	-16.54		-20.22		
27.d	Cos AIG 1X	volts rms	+16.54		+20.22		
27.e	Cos AMG 1X	volts rms	+16.54		+20.22		
27.f	Cos AOG 1X	volts rms	+16.54		+20.22		
28.a	Sin AIG 1X	deg	+181		+191		
28.b	Sin AMG 1X	deg	+181		+191		
28.c	Sin AOG 1X	deg	+181		+191		
28.d	Cos AIG 1X	deg	1.0		+11.0		
28.e	Cos AMG 1X	deg	1.0		+11.0		
28.f	Cos AOG 1X	deg	1.0		+11.0		

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EQUIPMENT TEST
DATA SHEET 4 **OF** 5

JDC
NO. 12216
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JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29.a	Sin AIG	v rms	-15.64		-19.12		
29.b	Cos AIG	v rms	+15.64		+19.12		
29.c	Sin AMG	v rms	-15.64		-19.12		
29.d	Cos AMG	v rms	+15.64		+19.12		
29.e	Sin AOG	v rms	-15.64		-19.12		
29.f	Cos AOG	v rms	+15.64		+19.12		
31	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
34	MG CDU rate	deg/sec	00012 .00000	Row 1 ( ) _____ Row 2 ( )._____	00016 .00000		
35	IG CDU rate	deg/sec	00012 .00000	Row 1 ( ) _____ Row 2 ( )._____	00016 .00000		
36	OG CDU rate	deg/sec	00012 .00000	Row 1 ( ) _____ Row 2 ( )._____	00016 .00000		
46	Shaft CDU rate	deg/sec	00005 .49000	Row 1 ( ) _____ Row 2 ( )._____	00009 .15000		
47	TRUNNION CDU rate	deg/sec	00001 .38000	Row 1 ( ) _____ Row 2 ( )._____	00002 .28000		
1, 2 3, 4, 5, 7 14, 15 16, 18 19, 20 21, 22 23, 25 26, 32	Displays and Lamps			Reacted as specified			

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EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
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JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
33, 37, 38, 39, 40, 48	Displays and Lamps (cont)			Reacted as specified			

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JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV. M PAGE 1 OF 21
INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and attitude error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	9-1-66	30931	2, 4	-	JP	-
B	11-10-66	31896	All	-	EA	-
C	11-15-66	31937	1, 2, 3, 5	4	EA	-
D	11-17-66	31933	6	-	EA	-
E	1-12-67	32622	1, 6	-	EA	-
F	5-4-67	33721	-	1, 2, 3	EA	-
G	6-6-67	33904	7	-	EA	-
H	10-5-67	34807	7	-	EA	-
J	1-16-68	35446	1-3	2	EA	-
K	8-26-68	36713	All	All	EA	-
L	3-11-69	37406	2, 18	-	EA	-
M	5-26-70	38127	1, 20	-	EA	-

REFERENCES - PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) or Restart Monitor module (2898989) is connected to CGC test connector before proceeding.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used.

Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM [illegible]0113A
Chg. 3-18-66

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:

None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:

JDC 12216 CTS UPLINK Tape, P/N 2901649-002

NOTE: Prepare the CGC for the UPLINK code by establishing the following conditions on the CTS:

a. Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

b. Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

c. Set digitswitches on Self Test Assembly to 00000.

d. Self Test Panel - Press to light SELF TEST pushbutton.

e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape.

MANUAL LOAD PROCEDURES

1. Perform JDC 12215, excluding steps 16 and 17, to establish a Master Initialization condition.
2. Press to light OPTICS POWER ON pushbutton on Test Control panel.
3. Perform following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	01300		ENTR
c.	40266		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

f. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

g. RDC Interface panel - Press to light CH33-10 pushbutton.

h. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

i. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.

1. Perform JDC 12215, excluding steps 16 and 17, to establish a Master Initialization condition.

2. Press to light OPTICS POWER ON pushbutton on Test Control panel.

3. Press EXECUTE pushbutton on Programmer and Monitor panel.

3A. When tape stops, observe that VERB 21 NOUN 01 flash on DSKY and then press

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MANUAL LOAD PROCEDURES

d.	NOUN 15	ENTR	
e.	61304	ENTR	ENTR
f.	10000	ENTR	ENTR
g.	01325	ENTR	ENTR
h.	00023	ENTR	ENTR
i.	01325	ENTR	ENTR
j.	25546	ENTR	ENTR
k.	31344	ENTR	ENTR
l.	54324	ENTR	ENTR
m.	41345	ENTR	ENTR
n.	60150	ENTR	ENTR
o.	10000	ENTR	ENTR
p.	01332	ENTR	ENTR
q.	00050	ENTR	ENTR
r.	01332	ENTR	ENTR
s.	37640	ENTR	ENTR
t.	04451	ENTR	ENTR
u.	01337	ENTR	ENTR
v.	30005	ENTR	ENTR
w.	02324	ENTR	ENTR
x.	04505	ENTR	ENTR
y.	31315	ENTR	ENTR
z.	04451	ENTR	ENTR
aa.	01300	ENTR	ENTR
ab.	30005	ENTR	ENTR
ac.	04505	ENTR	ENTR
ad.	31315	ENTR	ENTR
ae.	04451	ENTR	ENTR
af.	01307	ENTR	ENTR
ag.	30005	ENTR	ENTR
ah.	04505	ENTR	ENTR
ai.	31346	ENTR	ENTR

CTS UPLINK TAPE LOAD PROCEDURES

EXECUTE pushbutton on Programmer and Monitor panel.

3B. When tape stops, observe that VERB 06 NOUN 01 flash on DSKY and that PROG 07 is displayed.

MANUAL LOAD PROCEDURES

aj. 54150 ENTR ENTR
ak. 54331 ENTR ENTR
al. 05572 ENTR ENTR
am. 04505 ENTR ENTR
an. 00002 ENTR ENTR
ao. 30364 ENTR ENTR
ap. 30376 ENTR
aq. VERB 25 NOUN 26 ENTR
ar. 00001 ENTR
as. 01300 ENTR
at. 30005 ENTR
au. VERB 31 ENTR
av. VERB 57 ENTR
aw. Observe:
VERB 21 NOUN 01 Flashing
ax. 00010 ENTR
ay. Observe:
VERB 06 NOUN 01 Flashing
az. Observe:
PROG 07 Displayed

CDU ZERO

4. Enter VERB 33 and press ENTR pushbutton on DSKY. NO ATT lamp shall light. After approximately 20 seconds, VERB 06 NOUN 02 shall flash.

5. Observe the Gimbal angles, approximately 0.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

TOTAL ATTITUDE SINE IN-PHASE, TOTAL NULL

6. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1.

CTS UPLINK TAPE LOAD PROCEDURES

CDU ZERO

4. Press EXECUTE pushbutton on Programmer and Monitor panel. NO ATT lamp on DSKY shall light. After approximately 20 seconds, VERB 06 NOUN 02 shall flash.

5. Observe the Gimbal angles, approximately 0.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

TOTAL ATTITUDE SINE IN-PHASE, TOTAL NULL

6. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1.

MANUAL LOAD PROCEDURES

Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

7. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 03 shall flash. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3.

TOTAL ATTITUDE OUTPUTS

8. Set VOLTMETER INPUT switch on Primary Signal Selector panel to either PAVM SIG 1 or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each output specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test

CTS UPLINK TAPE LOAD PROCEDURES

Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

7. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 03 shall flash on DSKY. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3.

TOTAL ATTITUDE OUTPUTS

8. Set VOLTMETER INPUT switch on Primary Signal Selector panel to either PAVM SIG 1 or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each output specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test

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MANUAL LOAD PROCEDURES

Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

11. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.

IMU CDU AC D/A OUTPUTS

12. Set CROSSBAR CONTROL on Primary Signal Selector panel to 199. Connect buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB-4, 45 (high) and 49 (low),
IG AC D/A error
b. TB-4, 44 (high) and 48 (low),
MG AC D/A error
c. TB-4, 43 (high) and 47 (low),
OG AC D/A error

CTS UPLINK TAPE LOAD PROCEDURES

Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

11. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.

IMU CDU AC D/A OUTPUTS

12. Set CROSSBAR CONTROL on Primary Signal Selector panel to 199. Connect buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB-4, 45 (high) and 49 (low),
IG AC D/A error
b. TB-4, 44 (high) and 48 (low),
MG AC D/A error
c. TB-4, 43 (high) and 47 (low),
OG AC D/A error

MANUAL LOAD PROCEDURES

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press ENTR pushbutton on DSKY. NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

+ GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 14:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.
b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

14. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
NO ATT lamp lights
c. Observe:
VERB 06 NOUN 05 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator Control panel, and G/N CAUTION lamp on Monitor panel shall light.

CTS UPLINK TAPE LOAD PROCEDURES

CDU REPEATING ACCURACY 45°

13. Press EXECUTE pushbutton on Programmer and Monitor panel. NO ATT lamp on DSKY shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

+ GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 14:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.
b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

14. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 05 flash. The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator Control panel, and G/N CAUTION lamp on Monitor panel shall light.

MANUAL LOAD PROCEDURES

TOTAL ATTITUDE COSINE, TOTAL NULL

15. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 06 shall flash.

16. Observe the Gimbal angles, approximately 90.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

17. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY 135°

18. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 07 shall flash. Record Gimbal angles displayed in Row 1, Row 2, and Row 3.

19. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 10 shall flash. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe Gimbal angles, approximately 135°, 135°, and 45° respectively, are displayed in Row 1, Row 2, and Row 3 of the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TOTAL ATTITUDE COSINE, TOTAL NULL

15. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 06 shall flash on DSKY.

16. Observe the Gimbal angles, approximately 90.0°, are displayed on Rows 1, 2, and 3 of the DSKY.

17. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY 135°

18. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 07 shall flash on DSKY. Record Gimbal angles displayed in Row 1, Row 2, and Row 3.

19. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 10 shall flash on DSKY. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe Gimbal angles, approximately 135°, 135°, and 45° respectively, are displayed in Row 1, Row 2, and Row 3 of the DSKY.

MANUAL LOAD PROCEDURES

CDU REPEATING ACCURACY 135°

20. Enter VERB 33 and press ENTR pushbutton on DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

CDU COMMAND ACCURACY 225°

21. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:
NO ATT lamp lights

c. Observe:
VERB 06 NOUN 12 Flashing after approx. 20 seconds

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 22:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

22. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY. The

CTS UPLINK TAPE LOAD PROCEDURES

CDU REPEATING ACCURACY 135°

20. Press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on the DSKY shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

CDU COMMAND ACCURACY 225°

21. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 12 flash.

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 22:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

22. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY. The

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MANUAL LOAD PROCEDURES

GIMBAL LOCK lamps on DSKY and Monitor panel, the G/N CAUTION lamp on Monitor panel, and the PGNS lamp on Indicator Control panel shall be lighted.

23. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 13 shall flash. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe the Gimbal angles, approximately 225°, 225°, and 315° respectively, are displayed in Rows 1, 2, and 3 of the DSKY.

CDU REPEATING ACCURACY 225°

24. Enter VERB 33 and press ENTR pushbutton on DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

TOTAL ATTITUDE OUTPUTS 315°

25. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:
NO ATT lamp lights

c. Observe:
VERB 06 NOUN 15 Flashing after approx. 20 seconds

26. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY.

27. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1

CTS UPLINK TAPE LOAD PROCEDURES

GIMBAL LOCK lamps on DSKY and Monitor panel, the G/N CAUTION lamp on Monitor panel, and the PGNS lamp on Indicator Control panel shall be lighted.

23. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 13 shall flash on DSKY. The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted. Observe the Gimbal angles, approximately 225°, 225°, and 315° respectively, are displayed on Rows 1, 2, and 3 of the DSKY.

CDU REPEATING ACCURACY 225°

24. Press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall go out. after approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

TOTAL ATTITUDE OUTPUTS 315°

25. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 15 flash.

26. Record the Gimbal angles displayed in Row 1, Row 2, and Row 3 of the DSKY.

27. Set VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1

MANUAL LOAD PROCEDURES

or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

28. Measure and record the phase angle of each output specified in step 27.

29. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

CTS UPLINK TAPE LOAD PROCEDURES

or SIG 2 as indicated below. Record the in-phase voltage for each corresponding CROSSBAR CONTROL setting as follows:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

28. Measure and record the phase angle of each output specified in step 27.

29. Press to light INTERFACE LOAD TEST pushbutton on Test Selector panel. Set INTERFACE LOAD TEST switch on Test Selector panel and CROSSBAR CONTROL on Primary Signal Selector panel to following positions and measure and record the indicated in-phase voltages. Press TEST START pushbutton after each setting of the INTERFACE LOAD TEST switch. Press TEST STOP pushbutton after each voltage measurement.

INTERFACE LOAD TEST Switch	CROSSBAR CONTROL
a. 2	144
b. 2	243
c. 3	143
d. 3	242
e. 4	142
f. 4	241

MANUAL LOAD PROCEDURES

30. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.

CDU REPEATING ACCURACY 315°

31. Enter VERB 33 and press ENTR pushbutton on DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

- GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 32:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

32. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:
NO ATT lamp lights

c. Observe:
VERB 06 NOUN 17 Flashing after approx. 20 seconds

CTS UPLINK TAPE LOAD PROCEDURES

30. Set INTERFACE LOAD TEST switch to OFF. Press to extinguish INTERFACE LOAD TEST pushbutton.

CDU REPEATING ACCURACY 315°

31. Press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall go out. After approximately 100 seconds, VERB 05 NOUN 30 shall flash. Record Row 1, Row 2, and Row 3 indications.

- GIMBAL LOCK TEST

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 32:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

32. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 17 flash. The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator panel, and G/N CAUTION lamp on Monitor panel shall light.

MANUAL LOAD PROCEDURES

The GIMBAL LOCK lamps on DSKY and Monitor panel, PGNS lamp on Indicator Control panel, and G/N CAUTION lamp on Monitor panel shall light.

33. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 20 seconds, VERB 06 NOUN 20 shall flash. Insure that Row 1, Row 2, and Row 3 display approximately 0°.

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 34:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

34. Enter VERB 33 and press ENTR pushbutton on DSKY. Observe that COMP ACTY lamp flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications (MG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel, the PGNS lamp on Indicator Control panel, and the G/N CAUTION lamp on Monitor panel shall light.

CTS UPLINK TAPE LOAD PROCEDURES

33. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 20 seconds, VERB 06 NOUN 20 shall flash on DSKY. Insure that Row 1, Row 2, and Row 3 display approximately 0°.

NOTE: When only one DSKY is available for testing, the following conditions will occur in step 34:

a. With DSKY in NAV DSKY location, the G/N CAUTION lamp on Monitor panel will not light as specified.

b. With DSKY in MAIN DSKY location, the PGNS lamp on Indicator Control panel will not light as specified.

34. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that COMP ACTY lamp flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications (MG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel, the PGNS lamp on Indicator panel, and the G/N CAUTION lamp on Monitor panel shall light.

MANUAL LOAD PROCEDURES

35. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash. Record Row 1 and Row 2 indications (IG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted.

36. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash. Record Row 1 and Row 2 indications (OG CDU rate).

IMU CDU FINE FAIL TEST

37. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:
NO ATT lamp goes out

c. Observe:
VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on DSKY and Monitor panel are not lighted.

38. Perform following DSKY operations:

a. +00100 ENTR

b. Observe:
VERB 22 NOUN 22 Flashing

d. +00100 ENTR

d. Observe:
VERB 23 NOUN 22 Flashing

e. +00100 ENTR

The NO ATT lamp shall light momentarily and then go out. After approximately 100

CTS UPLINK TAPE LOAD PROCEDURES

35. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash on DSKY. Record Row 1 and Row 2 indications (IG CDU rate). The GIMBAL LOCK lamps on DSKY and Monitor panel shall not be lighted.

36. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 30 seconds, observe that VERB 06 NOUN 66 flash on DSKY. Record Row 1 and Row 2 indications (OG CDU rate).

IMU CDU FINE FAIL TEST

37. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that NO ATT lamp on DSKY goes out. After approximately 20 seconds, observe that VERB 21 NOUN 22 flash. Observe GIMBAL LOCK lamps on DSKY and Monitor panel are not lighted.

38. Press EXECUTE pushbutton on Programmer and Monitor panel.

38A. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

38B. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall light momentarily and then go out. After approximately 100 seconds,

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MANUAL LOAD PROCEDURES

seconds, VERB 01 NOUN 10 shall flash and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

39. Perform following DSKY operations:

a. VERB 25 NOUN 26 ENTR

b. 00001 ENTR

c. 01300 ENTR

d. 30005 ENTR

e. VERB 31 ENTR

f. VERB 33 ENTR

g. Observe:
ISS lamp on Indicator Control panel goes out

h. Observe:
VERB 21 NOUN 22 Flashing after approx. 20 seconds

i. +03375 ENTR

j. Observe:
VERB 22 NOUN 22 Flashing

k. +03375 ENTR

l. Observe:
VERB 23 NOUN 22 Flashing

m. +03375 ENTR

The NO ATT lamp shall light momentarily and then go out. After approximately 90 seconds, VERB 01 NOUN 10 shall flash and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

CTS UPLINK TAPE LOAD PROCEDURES

VERB 01 NOUN 10 shall flash on DSKY and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

39. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that ISS lamp on Indicator Control panel goes out.

39A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

39B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

39C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. The NO ATT lamp on DSKY shall light momentarily and then go out. After approximately 90 seconds, VERB 01 NOUN 10 shall flash on DSKY and ISS lamp on Indicator Control panel shall light. Row 1 on DSKY shall indicate 33XXX and Row 3 shall indicate 00030.

MANUAL LOAD PROCEDURES

OPTICS RATE TEST

40. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:

ISS lamp on Indicator Control panel goes out

c. Observe:

NO ATT lamp lights

d. Observe:

VERB 06 NOUN 55 Flashing after approx. 20 seconds

41. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 42 applies to Indicator Control panel 2021290 only.

42. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to MAN.

NOTE: Step 43 applies to all Indicator Control panels except 2021290.

43. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

44. Using Optics Hand Controller, drive the Optics Shaft until the SHAFT TPAC indicates approximately +5 degrees.

CTS UPLINK TAPE LOAD PROCEDURES

OPTICS RATE TEST

40. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe that ISS lamp on Indicator Control panel goes out. Observe NO ATT lamp on DSKY lights. After approximately 20 seconds, observe that VERB 06 NOUN 55 flash.

41. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 42 applies to Indicator Control panel 2021290 only.

42. Set OPTICS ZERO switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to MAN.

NOTE: Step 43 applies to all Indicator Control panels except 2021290.

43. Set OPTICS MODE switch on Indicator Control panel to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

44. Using Optics Hand Controller, drive the Optics Shaft until the SHAFT TPAC indicates approximately +5 degrees.

MANUAL LOAD PROCEDURES

45. Set OPTICS MODE switch to CMC.

SHAFT RATE TEST

46. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 25 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications

TRUNNION RATE TEST

47. Enter VERB 33 and press ENTR pushbutton on DSKY. After approximately 15 seconds, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

48. Enter VERB 34 and press ENTR pushbutton on DSKY. Observe PROG display indicates 00.

OPTICS CDU FAIL TEST

49. Set OPTICS MODE switch on Indicator Control panel to MAN.

50. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00000 ENTR

51. Using Optics Hand Controller on Indicator Control panel, drive optics until SHAFT TPAC indicates 1.65 (±0.15) degrees and TRUNNION TPAC indicates 0.00 degrees. Set OPTICS SPEED switch to HI and LO as required.

CTS UPLINK TAPE LOAD PROCEDURES

45. Set OPTICS MODE switch to CMC.

SHAFT RATE TEST

46. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 25 seconds, VERB 06 NOUN 66 shall flash on DSKY. Record Row 1 and Row 2 indications.

TRUNNION RATE TEST

47. Press EXECUTE pushbutton on Programmer and Monitor panel. After approximately 15 seconds, VERB 06 NOUN 66 shall flash on DSKY. Record Row 1 and Row 2 indications.

48. Press EXECUTE pushbutton on Programmer and Monitor panel. Observe PROG display on DSKY indicates 00.

OPTICS CDU FAIL TEST

49. Set OPTICS MODE switch on Indicator Control panel to MAN.

50. Press EXECUTE pushbutton on Programmer and Monitor panel.

51. Using Optics Hand Controller on Indicator Control panel, drive optics until SHAFT TPAC indicates 1.65 (±0.15) degrees and TRUNNION TPAC indicates 0.00 (±0.10) degrees. Set OPTICS SPEED switch to HI and LO as required.

MANUAL LOAD PROCEDURES

52. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00001 ENTR

d. Observe:

TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel light.

53. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00000 ENTR

d. Press RSET

e. Observe:

TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel go out.

54. Using Optics Hand Controller on Indicator Control panel, drive optics until SHAFT TPAC indicates 0.00 degrees and TRUNNION TPAC indicates 0.85 (±0.10) degrees.

55. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00001 ENTR

d. Observe:

TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel light.

CTS UPLINK TAPE LOAD PROCEDURES

52. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, observe that TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel light.

53. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, observe that TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel go out.

54. Using Optics Hand Controller on Indicator Control panel, drive optics until SHAFT TPAC indicates 0.00 (±0.15) degrees and TRUNNION TPAC indicates 0.85 (±0.10) degrees.

55. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, observe that TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel light.

MANUAL LOAD PROCEDURES

56. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00000 ENTR

d. Press RSET

e. Observe:

TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel go out.

NOTE: Step 56A applies only when Restart Monitor Module (2898989) is installed.

56A. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00077 ENTR

c. The contents of Row 1 shall be 00000.

57. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

CTS UPLINK TAPE LOAD PROCEDURES

56. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, observe that TRACKER lamp on DSKY, G/N CAUTION lamp on Monitor panel, and PGNS lamp on Indicator Control panel go out.

NOTE: Step 56A applies only when Restart Monitor Module (2898989) is installed.

56A. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00077 ENTR

c. The contents of Row 1 shall be 00000.

57. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

58. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

59. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

60. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press to light MONITOR pushbutton. AGC INPUT-CTR pushbutton shall go out.

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SUBSYSTEM G & N SYSTEM | ASSY

61. Rewind and remove tape from Tape Reader and set Power switch to OFF.

62. Press to extinguish SELF TEST pushbutton on Self Test panel.

63. Remove Self Test Assembly from Buffer Box Assembly.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12216
REV. M
INITIAL TDRR 29882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE

NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
6.a	Sine AIG 1X Total	mv rms	0		150		
6.b	Sine AMG 1X Total	mv rms	0		150		
6.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X	v rms	16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	1.0		+11.0		
9.b	Sin AMG 1X	deg	1.0		+11.0		
9.c	Sin AOG 1X	deg	1.0		+11.0		
9.d	Cos AIG 1X	deg	1.0		+11.0		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

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NO. 12216
REV. M

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	1.0		+11.0		
9.f	Cos AOG 1X	deg	1.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	0		0.30		
12.b	MG AC D/A Error	volts rms	0		0.30		
12.c	OG AC D/A Error	volts rms	0		0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
18	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
20	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12216
REV. M

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
22	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
24	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
26	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
27.a	Sin AIG 1X	volts rms	-16.54		-20.22		
27.b	Sin AMG 1X	volts rms	-16.54		-20.22		
27.c	Sin AOG 1X	volts rms	-16.54		-20.22		
27.d	Cos AIG 1X	volts rms	+16.54		+20.22		
27.e	Cos AMG 1X	volts rms	+16.54		+20.22		
27.f	Cos AOG 1X	volts rms	+16.54		+20.22		
28.a	Sin AIG 1X	deg	+181		+191		
28.b	Sin AMG 1X	deg	+181		+191		
28.c	Sin AOG 1X	deg	+181		+191		
28.d	Cos AIG 1X	deg	1.0		+11.0		
28.e	Cos AMG 1X	deg	1.0		+11.0		
28.f	Cos AOG 1X	deg	1.0		+11.0		

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DATA SHEET 4 OF 5

JDC
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JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29.a	Sin AIG	v rms	-15.64		-19.12		
29.b	Cos AIG	v rms	+15.64		+19.12		
29.c	Sin AMG	v rms	-15.64		-19.12		
29.d	Cos AMG	v rms	+15.64		+19.12		
29.e	Sin AOG	v rms	-15.64		-19.12		
29.f	Cos AOG	v rms	+15.64		+19.12		
31	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
34	MG CDU rate	deg/sec	00012 .00000	Row 1 ( ) _____ Row 2 ( )._____	00016 .00000		
35	IG CDU rate	deg/sec	00012 .00000	Row 1 ( ) _____ Row 2 ( )._____	00016 .00000		
36	OG CDU rate	deg/sec	00012 .00000	Row 1 ( ) _____ Row 2 ( )._____	00016 .00000		
46	Shaft CDU rate	deg/sec	00005 .49000	Row 1 ( ) _____ Row 2 ( )._____	00009 .15000		
47	TRUNNION CDU rate	deg/sec	00001 .38000	Row 1 ( ) _____ Row 2 ( )._____	00002 .28000		
1, 2 3, 4, 5, 7 14, 15 16, 18 19, 20 21, 22 23, 25 26, 32	Displays and Lamps			Reacted as specified			

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
REV. M

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
33, 37, 38, 39, 40, 48	Displays and Lamps (cont)			Reacted as specified			

DATE 30 JUN 66

JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV. - PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 7 5

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to verify the IMU CDU moding, CDU repeating accuracy, CDU command accuracy, CDU command rate and Attitude Error positioning commands. The test is under CGC program control but provides operator control intervals to make analog measurements.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES
PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Establish a Master Initialization condition and insure the Cradle Assembly is set to 32.5°.

2. Perform the following DSKY operations:

a. VERB 57		ENTR	
b. Observe VERB 21	NOUN 01	Flashing	
c. 00010		ENTR	
d. Observe VERB 06	NOUN 01	Flashing	
e. Observe PROG 07		Displayed	

CDU ZERO

3. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamps shall light. After approximately 20 seconds, VERB 06 and NOUN 02 shall commence flashing.

4. Observe the Gimbal Angles, approximately 0.0°, are displayed on Rows 1, 2 and 3 of the NAV DSKY.

TOTAL ATTITUDE SINE INPHASE, TOTAL NULL

5. Set the Voltmeter Input to PAVM SIG 1. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV - PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

6. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 03 shall commence flashing.

7. Observe and record the Gimbal Angles displayed on Rows 1, 2 and 3 of the NAV DSKY.

TOTAL ATTITUDE OUTPUTS

8. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1X resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

9. Measure the phase angle of each of the outputs specified in step 8.

TOTAL ATTITUDE, BACKUP MODE

10. Press the INTERFACE LOAD TEST pushbutton on the Test Control panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector, and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

11. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall go out.

IMU CDU AC D/A OUTPUTS

12. Connect Buffered probes to each of the following test points on TPA #2. Record the total voltage indication on the PAVM for each signal:

a. TB4, 45(hi), 49(lo), IG AC D/A Error
b. TB4, 44(hi), 48(lo), MG AC D/A Error
c. TB4, 43(hi), 47(lo), OG AC D/A Error

CDU REPEATING ACCURACY 45°

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Rows 1, 2 and 3 of the DSKY.

TOTAL ATTITUDE COSINE, TOTAL NULL

14. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp lights

DATE ________

JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV - PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

c. Observe VERB 06	NOUN 05	Flashing after approx. 20 seconds	

The GIMBAL LOCK lamps on the DSKYs and the Monitor panel shall light, the PGNS lamp on the Indicator Control panel shall light and the G/N CAUTION lamp on the Monitor panel shall light.

15. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 06 shall commence flashing.

16. Observe the Gimbal Angles, approximately 90.0°, are displayed on Rows 1, 2 and 3 of the DSKYs.

17. Set the Voltmeter Input to PAVM SIG 2. Record the total voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Cos AIG 1X resolver	243
b. Cos AMG 1X resolver	242
c. Cos AOG 1X resolver	241

CDU COMMAND ACCURACY (135°)

18. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 07 shall commence flashing.

19. Observe and record the Gimbal Angles are displayed on Row 1, Row 2 and Row 3 of the NAV DSKY.

20. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 10 shall commence flashing. The GIMBAL LOCK indicators on the DSKYs and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 135°, 135° and 45° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKYs.

CDU REPEATING ACCURACY (135°)

21. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

CDU COMMAND ACCURACY (225°)

22. Perform the following DSKY operations:

a. VERB 33		ENTR	
b. Observe NO ATT lamp lights			
c. Observe VERB 06	NOUN 12	Flashing after approx. 20 seconds	

23. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the NAV DSKY. The GIMBAL LOCK lamps on the DSKYs and Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

DATE ________

JOB SEMI AUTOMATIC MODE TEST

JDC 12216 REV - PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

24. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 13 shall commence flashing. The GIMBAL LOCK indicators on the DSKYs and the Monitor panel shall not be lighted. Observe the Gimbal Angles, approximately 225°, 225° and 315° respectively, are indicated on Row 1, Row 2 and Row 3 of the DSKYs.

CDU REPEATING ACCURACY (225°)

25. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

TOTAL ATTITUDE OUTPUTS (315°)

26. Perform the following DSKY operations:

a. VERB 33		ENTR	
b. Observe NO ATT lamp lights			
c. Observe VERB 06	NOUN 15	Flashing after approx. 20 seconds	

27. Observe and record the Gimbal Angles displayed on Row 1, Row 2 and Row 3 of the NAV DSKY.

28. Set the Voltmeter Input to PAVM SIG 1 or 2 as indicated below. Record the inphase voltage for each corresponding CROSSBAR CONTROL setting on the Primary Signal Selector panel:

Signal	CROSSBAR CONTROL
a. Sin AIG 1X resolver	144
b. Sin AMG 1X resolver	143
c. Sin AOG 1X resolver	142
d. Cos AIG 1Z resolver	243
e. Cos AMG 1X resolver	242
f. Cos AOG 1X resolver	241

29. Measure and record the phase angle of each of the outputs specified in step 28.

30. Press the INTERFACE LOAD TEST pushbutton on the Test Control panel. The pushbutton shall light. Set the INTERFACE LOAD TEST selector and the CROSSBAR CONTROL on the Primary Signal Selector panel to the following positions and measure and record the indicated inphase voltages.

	INTERFACE LOAD TEST selector	CROSSBAR CONTROL
a.	2	144
b.	2	243
c.	3	143
d.	3	242
e.	4	142
f.	4	241

31. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall go out.

CDU REPEATING ACCURACY (315°)

32. Enter VERB 33 and press the ENTR pushbutton on the DSKY. The NO ATT lamp shall go out. After approximately 100 seconds, VERB 05 and NOUN 30 shall commence flashing. Record indications on Row 1, Row 2 and Row 3 of the DSKY.

DATE ________

JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV - PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

-GIMBAL LOCK TEST

33. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp lights
c. Observe
VERB 06 NOUN 17 Flashing after approx. 20 seconds

The GIMBAL LOCK lamps on the DSKYs and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS alarm lamp on the Indicator Control panel shall light. Observe the Gimbal Angles, approximately 289°, are indicated on Row 1, Row 2 and Row 3 of the DSKYs.

34. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 20 seconds, VERB 06 and NOUN 20 shall commence flashing. Insure that Row 1, Row 2 and Row 3 display approximately 0°.

IMU CDU COMMAND RATE TEST

35. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Observe that the COMP ACTY lamp on the DSKY flashes on for a few seconds and then goes out. After approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record indications of Row 1 and Row 2 on the DSKY. (MG CDU rate.) The GIMBAL LOCK lamps on the DSKYs and the Monitor panel, the G & N CAUTION lamp on the Monitor panel and the PGNS lamp on the Indicator Control panel shall be lighted.

36. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (IG CDU rate.) The GIMBAL LOCK lamps on the DSKY and the Monitor panel shall not be lighted.

37. Perform the following DSKY operations:

a. VERB 33 ENTR

After approximately 30 seconds, observe that VERB 06 and NOUN 66 commence flashing. Record the indications on Row 1 and Row 2 of the DSKY. (OG CDU rate.)

IMU CDU FINE FAIL TEST

38. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
NO ATT lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds

Observe the GIMBAL LOCK lamps on the DSKYs and the Monitor panel are not lighted.

39. Perform the following DSKY operations:

a. +00100 ENTR
b. Observe
VERB 22 NOUN 22 Flashing
c. +00100 ENTR

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JOB SEMI AUTOMATIC MODE TEST | JDC 12216 REV - PAGE 6 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

d. Observe
VERB 23 NOUN 22 Flashing
e. +00100 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 100 seconds, VERB 01, and NOUN 10 shall commence flashing. The ISS WARNING and alarm lamps on the Monitor panel and the Indicator Control panel shall light.

40. Row 1 of the DSKYs shall indicate 33XXX and Row 3 shall indicate 00030.

IMU CDU COARSE FAIL TEST

41. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
VERB 21 NOUN 22 Flashing after approx. 20 seconds
c. +03375 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +03375 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +03375 ENTR

The NO ATT lamp shall light momentarily then go out. After approximately 90 seconds, VERB 01 and NOUN 10 shall commence flashing. The ISS WARNING and alarm lamps on the Monitor panel and the Indicator Control panel shall light.

42. Row 1 of the DSKYs shall indicate 33XXX and Row 3 shall indicate 00030.

OPTICS RATE TEST

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
ISS WARNING lamp goes out
c. Observe
NO ATT lamp lights
d. Observe
VERB 06 NOUN 55 Flashing after approx. 20 seconds

44. Set the OPTICS MODE switch on the Indicator Control panel to MAN then to ZERO. Wait 15 seconds.

45. Set the OPTICS MODE switch to CMC.

SHAFT RATE TEST

46. Enter VERB 33 and press the ENTR pushbutton on the DSKY. After approximately 25 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2.

TRUNNION RATE TEST

47. Perform the following DSKY operations:

a. VERB 33 ENTR

In approximately 15 seconds, VERB 06 and NOUN 66 shall commence flashing. Record the indications on Row 1 and Row 2 of the DSKY.

48. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC NO. 12216
REV. -

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9.e	Cos AMG 1X	deg	0.0		+11.0		
9.f	Cos AOG 1X	deg	0.0		+11.0		
10.a	Sin AIG	v rms	15.64		19.12		
10.b	Cos AIG	v rms	15.64		19.12		
10.c	Sin AMG	v rms	15.64		19.12		
10.d	Cos AMG	v rms	15.64		19.12		
10.e	Sin AOG	v rms	15.64		19.12		
10.f	Cos AOG	v rms	15.64		19.12		
12.a	IG AC D/A Error	volts rms	-0.30		+0.30		
12.b	MG AC D/A Error	volts rms	-0.30		+0.30		
12.c	OG AC D/A Error	volts rms	-0.30		+0.30		
13	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
17.a	Cos AIG 1X Total	mv rms	0		150		
17.b	Cos AMG 1X Total	mv rms	0		150		
17.c	Cos AOG 1X Total	mv rms	0		150		
19	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
21	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC NO. 12216
REV. -
INITIAL TDRR 27882

JOB SEMI AUTOMATIC MODE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	Sine AIG 1X Total	mv rms	0		150		
5.b	Sine AMG 1X Total	mv rms	0		150		
5.c	Sine AOG 1X Total	mv rms	0		150		
7	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
8.a	Sin AIG 1X		16.54		20.22		
8.b	Sin AMG 1X	v rms	16.54		20.22		
8.c	Sin AOG 1X	v rms	16.54		20.22		
8.d	Cos AIG 1X	v rms	16.54		20.22		
8.e	Cos AMG 1X	v rms	16.54		20.22		
8.f	Cos AOG 1X	v rms	16.54		20.22		
9.a	Sin AIG 1X	deg	0.0		+11.0		
9.b	Sin AMG 1X	deg	0.0		+11.0		
9.c	Sin AOG 1X	deg	0.0		+11.0		
9.d	Cos AIG 1X	deg	0.0		+11.0		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12216
REV. -

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21 (cont)	Row 3 Δ MGA	deg bits	77774		00003		
23	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
25	Row 1 ΔOGA	deg bits	77774		00003		
	Row 2 ΔIGA	deg bits	77774		00003		
	Row 3 ΔMGA	deg bits	77774		00003		
27	Row 1 OGA	deg	▨		▨		
	Row 2 IGA	deg	▨		▨		
	Row 3 MGA	deg	▨		▨		
28.a	Sin AIG 1X	volts rms	-16.54		-20.22		
28.b	Sin AMG 1X	volts rms	-16.54		-20.22		
28.c	Sin AOG 1X	volts rms	-16.54		-20.22		
28.d	Cos AIG 1X	volts rms	+16.54		+20.22		
28.e	Cos AMG 1X	volts rms	+16.54		+20.22		
28.f	Cos AOG 1X	volts rms	+16.54		+20.22		
29.a	Sin AIG 1X	deg	+180		+191		
29.b	Sin AMG 1X	deg	+180		+191		
29.c	Sin AOG 1X	deg	+180		+191		
29.d	Cos AIG 1X	deg	0		+11.0		
29.e	Cos AMG 1X	deg	0		+11.0		
29.f	Cos AOG 1X	deg	0		+11.0		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12216
REV. -

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
30.a	Sin AIG	v rms	-15.64		-19.12		
30.b	Cos AIG	v rms	+15.64		+19.12		
30.c	Sin AMG	v rms	-15.64		-19.12		
30.d	Cos AMG	v rms	+15.64		+19.12		
30.e	Sin AOG	v rms	-15.64		-19.12		
30.f	Cos AOG	v rms	+15.64		+19.12		
32	Row 1 Δ OGA	deg bits	77774		00003		
	Row 2 Δ IGA	deg bits	77774		00003		
	Row 3 Δ MGA	deg bits	77774		00003		
35	MG CDU rate	deg/sec	00014 00000	Row 1 Row 2	00018 00000		
36	IG CDU rate	deg/sec	00014 00000	Row 1 Row 2	00018 00000		
37	OG CDU rate	deg/sec	00014 00000	Row 1 Row 2	00018 00000		
46	Shaft CDU rate	deg/sec	00014 00000	Row 1 Row 2	00018 00000		
47	TRUNNION CDU rate	deg/sec	00007 00000	Row 1 Row 2	00009 00000		
1, 2 3, 4 6, 7 14, 15 16, 18 19, 20 22, 23 24, 26 27, 33	Displays and Lamps			Reacted as specified			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12216
REV. -

JOB SEMI AUTOMATIC MODE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34, 38 39, 40 41, 42 43, 48	Displays and Lamps (cont)			Reacted as specified			

DATE ________

JOB IMU PERFORMANCE TEST

JDC 12217 REV. A PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 9

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The three IRIG coefficient terms, NBD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7, 8	EA	-

REFERENCES PS 2015000

IMPORTANT Fill in Table 5 before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

	SIGNAL	CROSSBAR CONTROL
a.	X PIPA G/S output	251
b.	Y PIPA G/S output	152
c.	Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

c. Set the PIP AND IRIG S.F. MONITOR switch to OFF.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Perform following DSKY operations:

VERB 57 ENTR
00001 ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3).

If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.900
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+18000 ENTR
To correct ROW 2 -
VERB 22 ENTR
Test site latitude from Table 3 ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00001 ENTR

+NBDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S.F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00002 ENTR

-NBDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S.F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDX+ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00003 ENTR

-NBDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S.F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00004 ENTR

+NBDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

-NBDZ + ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+NBDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Y PIPA S. F. TEST

41. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDY + ADIAY

42. Calculate NBDZ + ADSRAZ. Position 5 (step 36) -2 (position 2) (step 21).

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. NBDZ + ADSRAZ value ENTR

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Perform calculations and complete data sheet.

48. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC NO. 12217
REV. A
INITIAL TDRR 29882

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨		
2.a	X PIPA G/S output	Volts ac	-.3		+.3		
2.b	Y PIPA G/S output	Volts ac	-.3		+.3		
2.c	Z PIPA G/S output	Volts ac	-.3		+.3		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC NO. 12217
REV. A

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+N BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	b
21	-N BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	d
23	-N BDX +ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e
26	-N BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	g

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12217
REV. A

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+N BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.___	▨	▨	▨	h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	i
32	-N BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.___	▨	▨	▨	j
36	-N BDZ + ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.___	▨	▨	▨	k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	l
40	+N BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.___	▨	▨	▨	m
41	-Y PIPA Test (ROW 1 indication) Position +00006 (Row 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	n

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
NO. 12217
REV. A

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	NBDZ + ADSRAZ = Position 5 -2 (Position 2)	meru	▨	( )___.___	▨	▨	▨	o
43	-N BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )___.___	▨	▨	▨	p

LINE	CALCULATION	PARAMETER	UNITS
q	-1 [- line e + line f] = ( )	ADIAX	meru
r	line h - line a = ( )	ADSRAY	meru
s	-1 [- line j + line c] = ( )	ADIAZ	meru
t	[line k - line c] = ( )	ADSRAZ	meru
u	line m + line f = ( )	ADSRAX	meru
v	line p + line a = ( )	ADIAY	meru
w	line b - line d = ( )	PIPA X 2G	cm/sec²
x	line l - line n = ( )	PIPA Y 2G	cm/sec²
y	line i - line g = ( )	PIPA Z 2G	cm/sec²
z	Enter local gravity (Table 4) ____.__		cm/sec²
aa	Nominal PIPA S.F. = 5.850000		cm/sec/pulse

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC
NO. 12217
REV. A

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ab	Multiply line z by line aa =		
ac	2 times line ab =		
ad	line ac ÷ line w = Enter this value on line bb		
ae	line ac ÷ line x = Enter this value on line bc		
af	line ac ÷ line y = Enter this value on line bd		
ag	1/2 (line b + line d) = ( ) __.___ Enter this value on line be		
ah	1/2 (line i + line g) = ( ) _.___ Enter this value on line bf		
ai	1/2 (line l + line n) = ( ) __.___ Enter this value on line bg.		
	Perform the following calculations for values of ΔBD, ΔADSRA, and ΔADIA. The constants are obtained from Table 5. Transfer results to items ar through az on data sheet.		
aj	ΔBDY = (line a) -(BDY) ΔBDY =		

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EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO. 12217
REV. A

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ak	ΔBDZ = (-line c) - (BDZ) ΔBDZ =		
al	ΔBDX = (- line f) - (BDX) ΔBDX =		
am	ΔADSRAY = (line r) - (ADSRAY) ΔADSRAY =		
an	ΔADSRAZ = (line t) - (ADSRAZ) ΔADSRAZ =		
ao	ΔADSRAX = (line u) - (ADSRAX) ΔADSRAX =		
ap	ΔADIAX = (line q) - (ADIAX) ΔADIAX =		
aq	ΔADIAZ = (line s) - (ADIAZ) ΔADIAZ =		
ar	ΔADIAY = (line v) - (ADIAY) ΔADIAY =		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC NO. 12217
REV. A

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
as	ΔBDY	meru	-5.0		+5.0		
at	ΔBDZ	meru	-5.0		+5.0		
au	ΔBDX	meru	-5.0		+5.0		
av	ΔADSRAY	meru	-10.0		+10.0		
aw	ΔADSRAZ	meru	-10.0		+10.0		
ax	ΔADSRAX	meru	-10.0		+10.0		
ay	Δ ADIAX	meru	-15.0		+15.0		
az	ΔADIAZ	meru	-15.0		+15.0		
ba	∠ADIAY	meru	-15.0		+15.0		
bb	X PIPA S.F. from line ad	cm/sec /pulse	5.847660		5.852340		
bc	Y PIPA S.F. from line ae	cm/sec /pulse	5.847660		5.852340		
bd	Z PIPA S.F. from line af	cm/sec /pulse	5.847660		5.852340		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC NO. 12217
REV. A

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
be	X PIPA Bias from line ag	cm/sec^2	-0.5		+5.0		
bf	Y PIPA Bias from line ah	cm/sec^2	-0.5		+5.0		
bg	Z PIPA Bias from line ai	cm/sec^2	-0.5		+5.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 9

JDC NO. 12217
REV.

JOB IMU PERFORMANCE TEST

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4

JDC	PARAMETER	VALUE
16236	BDX	
16236	ADSRAX	
16237	ADIAX	
16239	BDY	
16239	ADSRAY	
16240	ADIAY	
16242	BDZ	
16242	ADSRAZ	
16243	ADIAZ	

Table 5

DATE 30 JUN 66

JOB IMU PERFORMANCE TEST

JDC 12217 REV. B PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS 9

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The three IRIG coefficient terms, NBD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-

REFERENCES PS 2015000

IMPORTANT Fill in Table 5 before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

	SIGNAL	CROSSBAR CONTROL
a.	X PIPA G/S output	251
b.	Y PIPA G/S output	152
c.	Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

> NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

c. Set the PIP AND IRIG S.F. MONITOR switch to OFF.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Perform following DSKY operations:

VERB 57	ENTR
00001	ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3).

If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.900
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+18000	ENTR

To correct ROW 2 -

VERB 22	ENTR
Test site latitude from Table 3	ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00001	ENTR

+NBDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00002	ENTR

-NBDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDX+ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00003	ENTR

-NBDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S. F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00004	ENTR

+NBDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

JOB IMU PERFORMANCE TEST | JDC 12217 REV B PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDZ+ ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash, Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

-NBDZ + ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

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SUBSYSTEM G & N SYSTEM | ASSY

To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+NBDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Y PIPA S. F. TEST

41. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDY + ADIAY

42. Calculate NBDZ + ADSRAZ. Position 5 (step 36) -2 (position 2) (step 21).

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. NBDZ + ADSRAZ value ENTR

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Perform calculations and complete data sheet.

48. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC NO. 12217
REV. B
INITIAL TDRR 29832

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨		
2.a	X PIPA G/S output	Volts ac	-.3		+.3		
2.b	Y PIPA G/S output	Volts ac	-.3		+.3		
2.c	Z PIPA G/S output	Volts ac	-.3		+.3		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC NO. 12217
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+N BDY (ROW 2 indication) Position +00001	meru	▨	( ) ___.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²	▨	( ) ______. ( ) ______	▨	▨	▨	b
21	-N BDZ (ROW 2 indication) Position +00002	meru	▨	( ) ___.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²	▨	( ) ______. ( ) ______	▨	▨	▨	d
23	-N BDX +ADIAX (ROW 2 indication) Position +00002	meru	▨	( ) ___.__	▨	▨	▨	e
26	-N BDX (ROW 2 indication) Position +00003	meru	▨	( ) ___.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²	▨	( ) ______. ( ) ______	▨	▨	▨	g

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12217
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+N BDY + ADSRAY (ROW 2 indication) Position +00004	meru		( )___.___				h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2		( )______. ( )______				i
32	-N BDZ + ADIAZ (ROW 2 indication) Position +00004	meru		( )___.___				j
36	-N BDZ + ADSRAZ (ROW 2 indication) Position +00005	meru		( )___.___				k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2		( )______. ( )______				l
40	+N BDX + ADSRAX (ROW 2 indication) Position +00006	meru		( )___.___				m
41	-Y PIPA Test (ROW 1 indication) Position +00006 (Row 2 indication)	cm/sec^2		( )______. ( )______				n

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EQUIPMENT TEST
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JDC
NO. 12217
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	NBDZ + ADSRAZ = Position 5 -2 (Position 2)	meru		( )___.___				o
43	-N BDY + ADIAY (ROW 2 indication) Position +00006	meru		( )___.___				p

LINE	CALCULATION	PARAMETER	UNITS
q	-1 [- line e + line f] = ( )	ADIAX	meru
r	line h - line a = ( )	ADSRAY	meru
s	-1 [- line j + line c] = ( )	ADIAZ	meru
t	[line k - line c] = ( )	ADSRAZ	meru
u	line m + line f = ( )	ADSRAX	meru
v	line p + line a = ( )	ADIAY	meru
w	line b - line d = ( )	PIPA X 2G	cm/sec^2
x	line l - line n = ( )	PIPA Y 2G	cm/sec^2
y	line i - line g = ( )	PIPA Z 2G	cm/sec^2
z	Enter local gravity (Table 4)___.___		cm/sec^2
aa	Nominal PIPA S.F. = 5.850000		cm/sec/pulse

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EQUIPMENT TEST
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JDC
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JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ab	Multiply line z by line aa =		
ac	2 times line ab =		
ad	line ac ÷ line w = Enter this value on line bb		
ae	line ac ÷ line x = Enter this value on line bc		
af	line ac ÷ line y = Enter this value on line bd		
ag	1/2 (line b + line d) = ( ) __.___ Enter this value on line be		
ah	1/2 (line l + line n) = ( ) __.___ Enter this value on line bf		
ai	1/2 (line i + line g) = ( ) __.___ Enter this value on line bg.		
	Perform the following calculations for values of Δ BD, Δ ADSRA, and ΔADIA. The constants are obtained from Table 5. Transfer results to items ar through az on data sheet.		
aj	ΔBDY = (line a) -(BDY) ΔBDY =		

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EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO. 12217
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JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ak	ΔBDZ = (-line c) - (BDZ) ΔBDZ =		
al	ΔBDX = (- line f) - (BDX) ΔBDX =		
am	ΔADSRAY = (line r) - (ADSRAY) ΔADSRAY =		
an	ΔADSRAZ = (line t) - (ADSRAZ) ΔADSRAZ =		
ao	ΔADSRAX = (line u) - (ADSRAX) ΔADSRAX =		
ap	ΔADIAX = (line q) - (ADIAX) ΔADIAX =		
aq	ΔADIAZ = (line s) - (ADIAZ) ΔADIAZ =		
ar	ΔADIAY = (line v) - (ADIAY) ΔADIAY =		

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EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC
NO. 12217
REV. B

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
as	ΔBDY	meru	-5.0		+5.0		
at	ΔBDZ	meru	-5.0		+5.0		
au	ΔBDX	meru	-5.0		+5.0		
av	ΔADSRAY	meru	-10.0		+10.0		
aw	ΔADSRAZ	meru	-10.0		+10.0		
ax	ΔADSRAX	meru	-10.0		+10.0		
ay	Δ ADIAX	meru	-15.0		+15.0		
az	ΔADIAZ	meru	-15.0		+15.0		
ba	ΔADIAY	meru	-15.0		+15.0		
bb	X PIPA S.F. from line ad	cm/sec /pulse	5.847660		5.852340		
bc	Y PIPA S.F. from line ae	cm/sec /pulse	5.847660		5.852340		
bd	Z PIPA S.F. from line af	cm/sec /pulse	5.847660		5.852340		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC
NO. 12217
REV. B

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
be	X PIPA Bias from line ag	cm/sec^2	-0.5		+0.5		
bf	Y PIPA Bias from line ah	cm/sec^2	-0.5		+0.5		
bg	Z PIPA Bias from line ai	cm/sec^2	-0.5		+0.5		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 9

JDC
NO. 12217
REV. B

JOB IMU PERFORMANCE TEST

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4

JDC	PARAMETER	VALUE
16236	BDX	
16236	ADSRAX	
16237	ADIAX	
16239	BDY	
16239	ADSRAY	
16240	ADIAY	
16242	BDZ	
16242	ADSRAZ	
16243	ADIAZ	

Table 5

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JOB IMU PERFORMANCE TEST

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INITIAL TDRR 29882 D.S. PGS 9

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The three IRIG coefficient terms, NBD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
C	10-20-66	31614	1	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5 before proceeding with this JDC. 2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA Scale Factor Test within 0.2 hours of that time.

INITIALIZATION

1. Establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB IMU PERFORMANCE TEST

JDC 12217 REV C PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

c. Set the PIP AND IRIG S. F. MONITOR switch to OFF.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Perform following DSKY operations:

VERB 57	ENTR
00001	ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3).

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JOB IMU PERFORMANCE TEST

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SUBSYSTEM G & N SYSTEM

ASSY

If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.900
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+18000	ENTR

To correct ROW 2 -

VERB 22	ENTR
Test site latitude from Table 3	ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00001	ENTR

+NBDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00002	ENTR

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JOB IMU PERFORMANCE TEST

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SUBSYSTEM G & N SYSTEM

ASSY

-NBDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDX+ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00003	ENTR

-NBDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S. F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00004	ENTR

+NBDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

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JOB IMU PERFORMANCE TEST | JDC 12217 REV C PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDZ+ ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

-NBDZ + ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

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SUBSYSTEM G & N SYSTEM | ASSY

To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+NBDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Y PIPA S. F. TEST

41. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDY + ADIAY

42. Calculate NBDZ + ADSRAZ. Position 5 (step 36) -2 (position 2) (step 21).

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. NBDZ + ADSRAZ value ENTR

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Perform calculations and complete data sheet.

48. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC
NO. 12217
REV. C
INITIAL TDRR 29832

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨		
2.a	X PIPA G/S output	Volts ac	-.3		+.3		
2.b	Y PIPA G/S output	Volts ac	-.3		+.3		
2.c	Z PIPA G/S output	Volts ac	-.3		+.3		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC
NO. 12217
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+N BDY (ROW 2 indication) Position +00001	meru	▨	( )____.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	b
21	-N BDZ (ROW 2 indication) Position +00002	meru	▨	( )____.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )	▨	▨	▨	d
23	-N BDX +ADIAX (ROW 2 indication) Position +00002	meru	▨	( )____.__	▨	▨	▨	e
26	-N BDX (ROW 2 indication) Position +00003	meru	▨	( )____.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	g

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12217
REV. C

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+N BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.___	▨	▨	▨	h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	i
32	-N BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.___	▨	▨	▨	j
36	-N BDZ + ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.___	▨	▨	▨	k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	l
40	+N BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.___	▨	▨	▨	m
41	-Y PIPA Test (ROW 1 indication) Position +00006 (Row 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	n

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
NO. 12217
REV. C

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	NBDZ + ADSRAZ = Position 5 -2 (Position 2)	meru	▨	( )___.___	▨	▨	▨	o
43	-N BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )___.___	▨	▨	▨	p

LINE	CALCULATION	PARAMETER	UNITS
q	-1 [- line e + line f] = ( )	ADIAX	meru
r	line h - line a = ( )	ADSRAY	meru
s	-1 [- line j + line c] = ( )	ADIAZ	meru
t	[line k - line c] = ( )	ADSRAZ	meru
u	line m + line f = ( )	ADSRAX	meru
v	line p + line a = ( )	ADIAY	meru
w	line b - line d = ( )	PIPA X 2G	cm/sec^2
x	line l - line n = ( )	PIPA Y 2G	cm/sec^2
y	line i - line g = ( )	PIPA Z 2G	cm/sec^2
z	Enter local gravity (Table 4) ____.__		cm/sec^2
aa	Nominal PIPA S.F. = 5.850000		cm/sec/pulse

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JDC
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JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ab	Multiply line z by line aa =		
ac	2 times line ab =		
ad	line ac + line w = Enter this value on line bb		
ae	line ac ÷ line x = Enter this value on line bc		
af	line ac ÷ line y = Enter this value on line bd		
ag	1/2 (line b + line d) = ( ) __.___ Enter this value on line be		
ah	1/2 (line l + line n) = ( ) _.___ Enter this value on line bf		
ai	1/2 (line i + line g) = ( ) __.___ Enter this value on line bg.		
	Perform the following calculations for values of ΔBD, ΔADSRA, and ΔADIA. The constants are obtained from Table 5. Transfer results to items ar through az on data sheet.		
aj	ΔBDY = (line a) -(BDY) ΔBDY =		

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EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO. 12217
REV. C

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ak	ΔBDZ = (-line c) - (BDZ) ΔBDZ =		
al	ΔBDX = (- line f) - (BDX) ΔBDX =		
am	ΔADSRAY = (line r) - (ADSRAY) ΔADSRAY =		
an	ΔADSRAZ = (line t) - (ADSRAZ) ΔADSRAZ =		
ao	ΔADSRAX = (line u) - (ADSRAX) ΔADSRAX =		
ap	ΔADIAX = (line q) - (ADIAX) ΔADIAX =		
aq	ΔADIAZ = (line s) - (ADIAZ) ΔADIAZ =		
ar	ΔADIAY = (line v) - (ADIAY) ΔADIAY =		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 9

JDC
NO. 12217
REV. C

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
as	ΔBDY	meru	-5.0		+5.0		
at	ΔBDZ	meru	-5.0		+5.0		
au	ΔBDX	meru	-5.0		+5.0		
av	ΔADSRAY	meru	-10.0		+10.0		
aw	ΔADSRAZ	meru	-10.0		+10.0		
ax	ΔADSRAX	meru	-10.0		+10.0		
ay	Δ ADIAX	meru	-15.0		+15.0		
az	ΔADIAZ	meru	-15.0		+15.0		
ba	∠ADIAY	meru	-15.0		+15.0		
bb	X PIPA S.F. from line ad	cm/sec /pulse	5.847660		5.852340		
bc	Y PIPA S.F. from line ae	cm/sec /pulse	5.847660		5.852340		
bd	Z PIPA S.F. from line af	cm/sec /pulse	5.847660		5.852340		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 9

JDC
NO. 12217
REV. C

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
be	X PIPA Bias from line ag	cm/sec^2	-0.5		+0.5		
bf	Y PIPA Bias from line ah	cm/sec^2	-0.5		+0.5		
bg	Z PIPA Bias from line ai	cm/sec^2	-0.5		+0.5		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 **OF** 9

JDC
NO. 12217
REV. C

JOB IMU PERFORMANCE TEST

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4

JDC	PARAMETER	VALUE
16236	BDX	
16236	ADSRAX	
16237	ADIAX	
16239	BDY	
16239	ADSRAY	
16240	ADIAY	
16242	BDZ	
16242	ADSRAZ	
16243	ADIAZ	

Table 5

DATE 30 JUN 66

JOB IMU PERFORMANCE TEST

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INITIAL TDRR 29882 D.S. PGS 9

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The three IRIG coefficient terms, NBD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
Ⓜ C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5 before proceeding with this JDC. 2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA Scale Factor Test within 0.2 hours of that time.

INITIALIZATION

1. Establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT

ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

c. Set the PIP AND IRIG S. F. MONITOR switch to OFF.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Perform following DSKY operations:

VERB 57 ENTR
00001 ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3).

If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.900
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+18000 ENTR
To correct ROW 2 -
VERB 22 ENTR
Test site latitude from Table 3 ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00001 ENTR

+NBDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00002 ENTR

-NBDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDX+ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00003 ENTR

-NBDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S. F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00004 ENTR

+NBDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

SUBSYSTEM G & N SYSTEM

ASSY

-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDZ+ ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

-NBDZ + ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

SUBSYSTEM G & N SYSTEM

ASSY

To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+NBDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Y PIPA S. F. TEST

41. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDY + ADIAY

42. Calculate NBDZ + ADSRAZ. Position 5 (step 36) -2 (position 2) (step 21).

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. -NBDZ - ADSRAZ value ENTR

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Perform calculations and complete data sheet.

48. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC
NO. 12217
REV. D
INITIAL TDRR 29882

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨		
2.a	X PIPA G/S output	Volts ac	-.3		+.3		
2.b	Y PIPA G/S output	Volts ac	-.3		+.3		
2.c	Z PIPA G/S output	Volts ac	-.3		+.3		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC
NO. 12217
REV. D

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+N BDY (ROW 2 indication) Position +00001	meru	▨	( )____.___	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	b
21	-N BDZ (ROW 2 indication) Position +00002	meru	▨	( )____.___	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	d
23	-N BDX +ADIAX (ROW 2 indication) Position +00002	meru	▨	( )____.___	▨	▨	▨	e
26	-N BDX (ROW 2 indication) Position +00003	meru	▨	( )____.___	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	g

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12217
REV. D

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+N BDY + ADSRAY (ROW 2 indication) Position +00004	meru		( )___.___				h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2		( )_____. ( )_____				i
32	-N BDZ + ADIAZ (ROW 2 indication) Position +00004	meru		( )___.___				j
36	-N BDZ + ADSRAZ (ROW 2 indication) Position +00005	meru		( )___.___				k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2		( )_____. ( )_____				l
40	+N BDX + ADSRAX (ROW 2 indication) Position +00006	meru		( )___.___				m
41	-Y PIPA Test (ROW 1 indication) Position +00006 (Row 2 indication)	cm/sec^2		( )_____. ( )_____				n

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
NO. 12217
REV. D

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	NBDZ + ADSRAZ = Position 5 -2 (Position 2)	meru		( )___.___				o
43	-N BDY + ADIAY (ROW 2 indication) Position +00006	meru		( )___.___				p

LINE	CALCULATION	PARAMETER	UNITS
q	$-1\left[-\text{line e} + \text{line f}\right] = (\ )$	ADIAX	meru
r	line h - line a = ( )	ADSRAY	meru
s	$-1\left[-\text{line j} + \text{line c}\right] = (\ )$	ADIAZ	meru
t	$\left[\text{line k} - \text{line c}\right] \div (\ )$	ADSRAZ	meru
u	line m + line f = ( )	ADSRAX	meru
v	line p + line a = ( )	ADIAY	meru
w	line b - line d = ( )	PIPA X 2G	cm/sec^2
x	line l - line n = ( )	PIPA Y 2G	cm/sec^2
y	line i - line g = ( )	PIPA Z 2G	cm/sec^2
z	Enter local gravity (Table 4) ___.__		cm/sec^2
aa	Nominal PIPA S.F. = 5.850000		cm/sec/pulse

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EQUIPMENT TEST
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JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ab	Multiply line z by line aa =		
ac	2 times line ab =		
ad	line ac ÷ line w = Enter this value on line bb		
ae	line ac ÷ line x = Enter this value on line bc		
af	line ac ÷ line y = Enter this value on line bd		
ag	1/2 (line b + line d) = ( ) __.___ Enter this value on line be		
ah	1/2 (line l + line n) = ( ) __.___ Enter this value on line bf		
ai	1/2 (line i + line g) = ( ) __.___ Enter this value on line bg.		
	Perform the following calculations for values of ΔBD, ΔADSRA, and ΔADIA. The constants are obtained from Table 5. Transfer results to items ar through az on data sheet.		
aj	ΔBDY = (line a) -(BDY) ΔBDY =		

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EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO. 12217
REV. D

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ak	ΔBDZ = (-line c) - (BDZ) ΔBDZ =		
al	ΔBDX = (- line f) - (BDX) ΔBDX =		
am	ΔADSRAY = (line r) - (ADSRAY) ΔADSRAY =		
an	ΔADSRAZ = (line t) - (ADSRAZ) ΔADSRAZ =		
ao	ΔADSRAX = (line u) - (ADSRAX) ΔADSRAX =		
ap	ΔADIAX = (line q) - (ADIAX) ΔADIAX =		
aq	ΔADIAZ = (line s) - (ADIAZ) ΔADIAZ =		
ar	ΔADIAY = (line v) - (ADIAY) ΔADIAY =		

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EQUIPMENT TEST
DATA SHEET 7 **OF** 9

JDC
NO. 12217
REV. D

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
as	ΔBDY	meru	-5.0		+5.0		
at	ΔBDZ	meru	-5.0		+5.0		
au	ΔBDX	meru	-5.0		+5.0		
av	ΔADSRAY	meru	-10.0		+10.0		
aw	ΔADSRAZ	meru	-10.0		+10.0		
ax	ΔADSRAX	meru	-10.0		+10.0		
ay	Δ ADIAX	meru	-15.0		+15.0		
az	ΔADIAZ	meru	-15.0		+15.0		
ba	ΔADIAY	meru	-15.0		+15.0		
bb	X PIPA S.F. from line ad	cm/sec /pulse	5.847660		5.852340		
bc	Y PIPA S.F. from line ae	cm/sec /pulse	5.847660		5.852340		
bd	Z PIPA S.F. from line af	cm/sec /pulse	5.847660		5.852340		

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EQUIPMENT TEST
DATA SHEET 8 **OF** 9

JDC
NO. 12217
REV. D

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
be	X PIPA Bias from line ag	cm/sec^2	-0.5		+0.5		
bf	Y PIPA Bias from line ah	cm/sec^2	-0.5		+0.5		
bg	Z PIPA Bias from line ai	cm/sec^2	-0.5		+0.5		

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EQUIPMENT TEST
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JDC
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REV. D

JOB IMU PERFORMANCE TEST

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4

JDC	PARAMETER	VALUE
16236	BDX	
16236	ADSRAX	
16237	ADIAX	
16239	BDY	
16239	ADSRAY	
16240	ADIAY	
16242	BDZ	
16242	ADSRAZ	
16243	ADIAZ	

Table 5

DATE 30 JUN 66

JOB IMU PERFORMANCE TEST
JDC 12217 REV. E PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION The three IRIG coefficient terms, NBD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-
E	11-3-66	31779	4-6	2-6	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5 before proceeding with this JDC. 2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA Scale Factor Test within 0.2 hours of that time.

INITIALIZATION

1. Establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB IMU PERFORMANCE TEST
JDC 12217 REV E PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM
ASSY

ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

c. Set the PIP AND IRIG S. F. MONITOR switch to OFF.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting *
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Perform following DSKY operations:

VERB 57 ENTR
00001 ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3).

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JOB IMU PERFORMANCE TEST
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SUBSYSTEM G & N SYSTEM
ASSY

If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.900
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+18000 ENTR
To correct ROW 2 -
VERB 22 ENTR
Test site latitude from Table 3 ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00001 ENTR

+NBDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00002 ENTR

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JOB IMU PERFORMANCE TEST
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SUBSYSTEM G & N SYSTEM
ASSY

+NBDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDX+ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00003 ENTR

-NBDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S. F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00004 ENTR

+NBDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

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-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

+NBDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

+NBDZ - ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

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To correct ROW 2 -
VERB 22 ENTR
00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+NBDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Y PIPA S. F. TEST

41. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDY + ADIAY

42. Calculate -NBDZ - ADSRAZ: line k-2 (line c).

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. -NBDZ - ADSRAZ value ENTR
e. Press KEY REL if it flashes.

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Perform calculations and complete data sheet.

48. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

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EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC
NO. 12217
REV. E
INITIAL TDRR 29882

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ___

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨		
2.a	X PIPA G/S output	Volts ac	-.3		+.3		
2.b	Y PIPA G/S output	Volts ac	-.3		+.3		
2.c	Z PIPA G/S output	Volts ac	-.3		+.3		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC
NO. 12217
REV E

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+N BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²	▨	( )______. ( )_____	▨	▨	▨	b
21	+N BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²	▨	( )______. ( )_____	▨	▨	▨	d
23	-N BDX +ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e
26	-N BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²	▨	( )______. ( )_____	▨	▨	▨	g

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EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12217
REV. E

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+N BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	i
32	+N BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	j
36	+N BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.__	▨	▨	▨	k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	l
40	+N BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	m
41	-Y PIPA Test (ROW 1 indication) Position +00006 (Row 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	n

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EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
NO. 12217
REV. E

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	-NBDZ - ADSRAZ = line k - 2 (line c)	meru	▨	( )______	▨	▨	▨	o
43	-N BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )______	▨	▨	▨	p

LINE	CALCULATION	PARAMETER	UNITS
p.1	- line f =	NBDX	meru
p.2	line a	NBDY	meru
p.3	line c	NBDZ	meru
q	-1 [- line e + line f] = ( )	ADIAX	meru
r	line h - line a = ( )	ADSRAY	meru
s	+ line j - line c = ( )	ADIAZ	meru
t	- line k + line c = ( )	ADSRAZ	meru
u	line m + line f = ( )	ADSRAX	meru
v	line p + line a = ( )	ADIAY	meru
w	line b - line d = ( )	PIPA X 2G	cm/sec^2
x	line l - line n = ( )	PIPA Y 2 G	cm/sec^2
y	line g - line i = ( )	PIPA Z 2G	cm/sec^2
z	Enter local gravity (Table 4)______		cm/sec^2
aa	Nominal PIPA S. F. = 5.850000		cm/sec/pulse

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC
NO. 12217
REV. E

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ab	Multiply line z by line aa =		
ac	2 times line ab =		
ad	line ac ÷ line w = Enter this value on line bb		
ae	line ac ÷ line x = Enter this value on line bc		
af	line ac ÷ line y = Enter this value on line bd		
ag	1/2 (line b + line d) = ( ) __.___ Enter this value on line be		
ah	1/2 (line l + line n) = ( ) _.___ Enter this value on line bf		
ai	1/2 (line i + line g) = ( ) __.___ Enter this value on line bg.		
	Perform the following calculations for values of Δ BD, Δ ADSRA, and ΔADIA. The constants are obtained from Table 5. Transfer results to items ar through az on data sheet.		
aj	ΔBDY = (line p.2) - (BDY) ΔBDY =		

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EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO. 12217
REV. E

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ak	ΔBDZ = (+line p.3) - (BDZ) ΔBDZ =		
al	ΔBDX = (+line p.1) - (BDX) ΔBDX =		
am	ΔADSRAY = (line r) - (ADSRAY) ΔADSRAY =		
an	ΔADSRAZ = (line t) - (ADSRAZ) ΔADSRAZ =		
ao	ΔADSRAX = (line u) - (ADSRAX) ΔADSRAX =		
ap	ΔADIAX = (line q) - (ADIAX) ΔADIAX =		
aq	ΔADIAZ = (line s) - (ADIAZ) ΔADIAZ =		
ar	ΔADIAY = (line v) - (ADIAY) ΔADIAY =		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC
NO. 12217
REV. E

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
as	ΔBDY	meru	-5.0		+5.0		
at	ΔBDZ	meru	-5.0		+5.0		
au	ΔBDX	meru	-5.0		+5.0		
av	ΔADSRAY	meru	-10.0		+10.0		
aw	ΔADSRAZ	meru	-10.0		+10.0		
ax	ΔADSRAX	meru	-10.0		+10.0		
ay	Δ ADIAX	meru	-15.0		+15.0		
az	ΔADIAZ	meru	-15.0		+15.0		
ba	ΔADIAY	meru	-15.0		+15.0		
bb	X PIPA S.F. from line ad	cm/sec /pulse	5.847660		5.852340		
bc	Y PIPA S.F. from line ae	cm/sec /pulse	5.847660		5.852340		
bd	Z PIPA S.F. from line af	cm/sec /pulse	5.847660		5.852340		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC
NO. 12217
REV. E

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
be	X PIPA Bias from line ag	cm/sec^2	-0.5		+0.5		
bf	Y PIPA Bias from line ah	cm/sec^2	-0.5		+0.5		
bg	Z PIPA Bias from line ai	cm/sec^2	-0.5		+0.5		

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EQUIPMENT TEST
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JDC
NO. 12217
REV. E

JOB IMU PERFORMANCE TEST

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4

JDC	PARAMETER	VALUE
16236	BDX	
16236	ADSRAX	
16237	ADIAX	
16239	BDY	
16239	ADSRAY	
16240	ADIAY	
16242	BDZ	
16242	ADSRAZ	
16243	ADIAZ	

Table 5

DATE 30 JUN 66

JOB IMU PERFORMANCE TEST | **JDC** 12217 **REV.** F **PAGE** 1 **OF** 6
INITIAL TDRR 29882 **D.S. PGS** 9

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION The three IRIG coefficient terms, NBD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-
E	11-3-66	31779	4-6	2-6	EA	-
F	11-15-66	31938	-	1	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5 before proceeding with this JDC. 2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA Scale Factor Test within 0.2 hours of that time.

INITIALIZATION

1. Establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT

VERIFICATION WITH SIDL REQUIRED BEFORE USE

ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

c. Set the PIP AND IRIG S. F. MONITOR switch to OFF.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Perform following DSKY operations:

VERB 57	ENTR
00001	ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3).

If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.900
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+18000	ENTR

To correct ROW 2 -

VERB 22	ENTR
Test site latitude from Table 3	ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00001	ENTR

+NBDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00002	ENTR

+NBDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDX+ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00003	ENTR

-NBDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S. F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00004	ENTR

+NBDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

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SUBSYSTEM G & N SYSTEM | ASSY

-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

+NBDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

+NBDZ - ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

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SUBSYSTEM G & N SYSTEM | ASSY

To correct ROW 2 -
VERB 22 ENTR
00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+NBDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Y PIPA S. F. TEST

41. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDY + ADIAY

42. Calculate -NBDZ - ADSRAZ: line k-2 (line c).

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. -NBDZ - ADSRAZ value ENTR
e. Press KEY REL if it flashes.

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Perform calculations and complete data sheet.

48. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC
NO. 12217
REV. F
INITIAL TDRR 29882

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨		
2.a	X PIPA G/S output	Volts p-p	▨		15		
2.b	Y PIPA G/S output	Volts p-p	▨		15		
2.c	Z PIPA G/S output	Volts p-p	▨		15		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC
NO. 12217
REV. F

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+N BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	b
21	+N BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	d
23	-N BDX +ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e
26	-N BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	g

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12217
REV. F

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+N BDY + ADSRAY (ROW 2 indication) Position +00004	meru		( )___.___				h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec²		( )______. ( )______				i
32	+N BDZ + ADIAZ (ROW 2 indication) Position +00004	meru		( )___.___				j
36	+N BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru		( )___.___				k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec²		( )______. ( )______				l
40	+N BDX + ADSRAX (ROW 2 indication) Position +00006	meru		( )___.___				m
41	-Y PIPA Test (ROW 1 indication) Position +00006 (Row 2 indication)	cm/sec²		( )______. ( )______				n

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EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
NO. 12217
REV. F

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	-NBDZ - ADSRAZ = line k - 2 (line c)	meru		( )______				o
43	-N BDY + ADIAY (ROW 2 indication) Position +00006	meru		( )___.___				p

LINE	CALCULATION	PARAMETER	UNITS
p.1	- line f =	NBDX	meru
p.2	line a	NBDY	meru
p.3	line c	NBDZ	meru
q	-1 [- line e + line f] = ( )	ADIAX	meru
r	line h - line a = ( )	ADSRAY	meru
s	+ line j - line c = ( )	ADIAZ	meru
t	- line k + line c = ( )	ADSRAZ	meru
u	line m + line f = ( )	ADSRAX	meru
v	line p + line a = ( )	ADIAY	meru
w	line b - line d = ( )	PIPA X 2G	cm/sec²
x	line l - line n = ( )	PIPA Y 2 G	cm/sec²
y	line g - line i = ( )	PIPA Z 2G	cm/sec²
z	Enter local gravity (Table 4)___.___		cm/sec²
aa	Nominal PIPA S. F. = 5.850000		cm/sec/pulse

DATE

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC
NO. 12217
REV. F

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ab	Multiply line z by line aa =		
ac	2 times line ab =		
ad	line ac ÷ line w = Enter this value on line bb		
ae	line ac ÷ line x = Enter this value on line bc		
af	line ac ÷ line y = Enter this value on line bd		
ag	1/2 (line b + line d) = ( ) __.___ Enter this value on line be		
ah	1/2 (line l + line n) = ( ) _.___ Enter this value on line bf		
ai	1/2 (line i + line g) = ( ) __.___ Enter this value on line bg.		
	Perform the following calculations for values of Δ BD, Δ ADSRA, and ΔADIA. The constants are obtained from Table 5. Transfer results to items ar through az on data sheet.		
aj	ΔBDY (line p.2) - (BDY) ΔBDY =		

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EQUIPMENT TEST
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JDC
NO. 12217
REV. F

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ak	ΔBDZ = (+line p.3) - (BDZ) ΔBDZ =		
al	ΔBDX = (+line p.1) - (BDX) ΔBDX =		
am	ΔADSRAY = (line r) - (ADSRAY) ΔADSRAY =		
an	ΔADSRAZ = (line t) - (ADSRAZ) ΔADSRAZ =		
ao	ΔADSRAX = (line u) - (ADSRAX) ΔADSRAX =		
ap	ΔADIAX = (line q) - (ADIAX) ΔADIAX =		
aq	ΔADIAZ = (line s) - (ADIAZ) ΔADIAZ =		
ar	ΔADIAY = (line v) - (ADIAY) ΔADIAY =		

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EQUIPMENT TEST
DATA SHEET 7 **OF** 9

JDC
NO. 12217
REV. F

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
as	ΔBDY	meru	-5.0		+5.0		
at	ΔBDZ	meru	-5.0		+5.0		
au	ΔBDX	meru	-5.0		+5.0		
av	ΔADSRAY	meru	-10.0		+10.0		
aw	ΔADSRAZ	meru	-10.0		+10.0		
ax	ΔADSRAX	meru	-10.0		+10.0		
ay	Δ ADIAX	meru	-15.0		+15.0		
az	ΔADIAZ	meru	-15.0		+15.0		
ba	ΔADIAY	meru	-15.0		+15.0		
bb	X PIPA S.F. from line ad	cm/sec /pulse	5.847660		5.852340		
bc	Y PIPA S.F. from line ae	cm/sec /pulse	5.847660		5.852340		
bd	Z PIPA S.F. from line af	cm/sec /pulse	5.847660		5.852340		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 9

JDC
NO. 12217
REV. F

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
be	X PIPA Bias from line ag	cm/sec^2	-0.5		+0.5		
bf	Y PIPA Bias from line ah	cm/sec^2	-0.5		+0.5		
bg	Z PIPA Bias from line ai	cm/sec^2	-0.5		+0.5		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 **OF** 9

JDC
NO. 12217
REV. F

JOB IMU PERFORMANCE TEST

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4

JDC	PARAMETER	VALUE
16236	BDX	
16236	ADSRAX	
16237	ADIAX	
16239	BDY	
16239	ADSRAY	
16240	ADIAY	
16242	BDZ	
16242	ADSRAZ	
16243	ADIAZ	

Table 5

DATE 30 JUN 66

JDC 12217 REV. G PAGE 1 OF 6
INITIAL TDRR 29852 D.S. PGS. 9

JOB IMU PERFORMANCE TEST

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION The three IRIG coefficient terms, NBD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-
E	11-3-66	31779	4-6	2-6	EA	-
F	11-15-66	31938	-	1	EA	-
G	11-17-66	31932	3	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5 before proceeding with this JDC. 2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA Scale Factor Test within 0.2 hours of that time.

INITIALIZATION

1. Establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB IMU PERFORMANCE TEST
JDC 12217 REV G PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM
ASSY

ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S.F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

c. Set the PIP AND IRIG S.F. MONITOR switch to OFF.

Item	Signal	PTA/PEA PIP AND IRIG S.F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Perform following DSKY operations:

VERB 57 ENTR
00001 ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3).

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JOB IMU PERFORMANCE TEST
JDC 12217 REV G PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM
ASSY

If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+18000 ENTR
To correct ROW 2 -
VERB 22 ENTR
Test site latitude from Table 3 ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00001 ENTR

+NBDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S.F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00002 ENTR

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JOB IMU PERFORMANCE TEST
JDC 12217 REV G PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM
ASSY

+NBDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S.F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDX+ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00003 ENTR

-NBDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S.F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00004 ENTR

+NBDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

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SUBSYSTEM G & N SYSTEM ASSY

-Z PIPA S.F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

+NBDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

+NBDZ - ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

SUBSYSTEM G & N SYSTEM ASSY

To correct ROW 2 -
VERB 22 ENTR
00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+NBDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Y PIPA S. F. TEST

41. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDY + ADIAY

42. Calculate -NBDZ - ADSRAZ: line k-2 (line c).

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. -NBDZ - ADSRAZ value ENTR
e. Press KEY REL if it flashes.

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Perform calculations and complete data sheet.

48. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC NO. 12217
REV. G
INITIAL TDRR 29882

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨		
2.a	X PIPA G/S output	Volts p-p	▨		15		
2.b	Y PIPA G/S output	Volts p-p	▨		15		
2.c	Z PIPA G/S output	Volts p-p	▨		15		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC NO. 12217
REV. G

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+N BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	b
21	+N BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	d
23	-N BDX +ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e
26	-N BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	g

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12217
REV. G

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+N BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.___	▨	▨	▨	h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	i
32	+N BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.___	▨	▨	▨	j
36	+N BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.___	▨	▨	▨	k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	l
40	+N BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.___	▨	▨	▨	m
41	-Y PIPA Test (ROW 1 indication) Position +00006 (Row 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	n

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
NO. 12217
REV. G

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	-NBDZ - ADSRAZ = line k - 2 (line c)	meru	▨	( )___.___	▨	▨	▨	o
43	-N BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )___.___	▨	▨	▨	p

LINE	CALCULATION	PARAMETER	UNITS
p.1	- line f =	NBDX	meru
p.2	line a	NBDY	meru
p.3	line c	NBDZ	meru
q	-1 [- line e + line f] = ( )	ADIAX	meru
r	line h - line a = ( )	ADSRAY	meru
s	+ line j - line c = ( )	ADIAZ	meru
t	- line k + line c = ( )	ADSRAZ	meru
u	line m + line f = ( )	ADSRAX	meru
v	line p + line a = ( )	ADIAY	meru
w.	line b - line d = ( )	PIPA X 2G	cm/sec²
x	line l - line n = ( )	PIPA Y 2 G	cm/sec²
y	line g - line i = ( )	PIPA Z 2G	cm/sec²
z	Enter local gravity (Table 4)___.___		cm/sec²
aa	Nominal PIPA S. F. = 5.850000		cm/sec/pulse

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC
NO. 12217
REV. G

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ab	Multiply line z by line aa =		
ac	2 times line ab =		
ad	line ac + line w = Enter this value on line bb		
ae	line ac ÷ line x = Enter this value on line bc		
af	line ac ÷ line y = Enter this value on line bd		
ag	1/2 (line b + line d) = ( ) __.___ Enter this value on line be		
ah	1/2 (line l + line n) = ( ) _.___ Enter this value on line bf		
ai	1/2 (line i + line g) = ( ) __.___ Enter this value on line bg.		
	Perform the following calculations for values of Δ BD, Δ ADSRA, and ΔADIA. The constants are obtained from Table 5. Transfer results to items ar through az on data sheet.		
aj	ΔBDY · (line p.2) - (BDY) ΔBDY =		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO. 12217
REV. G

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ak	ΔBDZ = (+line p.3) - (BDZ) ΔBDZ =		
al	ΔBDX = (+line p.1) - (BDX) ΔBDX =		
am	ΔADSRAY = (line r) - (ADSRAY) ΔADSRAY =		
an	ΔADSRAZ = (line t) - (ADSRAZ) ΔADSRAZ =		
ao	ΔADSRAX = (line u) - (ADSRAX) ΔADSRAX =		
ap	ΔADIAX = (line q) - (ADIAX) ΔADIAX =		
aq	ΔADIAZ = (line s) - (ADIAZ) ΔADIAZ =		
ar	ΔADIAY = (line v) - (ADIAY) ΔADIAY =		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC
NO. 12217
REV. G

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
as	ΔBDY	meru	-5.0		+5.0		
at	ΔBDZ	meru	-5.0		+5.0		
au	ΔBDX	meru	-5.0		+5.0		
av	ΔADSRAY	meru	-10.0		+10.0		
aw	ΔADSRAZ	meru	-10.0		+10.0		
ax	ΔADSRAX	meru	-10.0		+10.0		
ay	Δ ADIAX	meru	-15.0		+15.0		
az	ΔADIAZ	meru	-15.0		+15.0		
ba	ΔADIAY	meru	-15.0		+15.0		
bb	X PIPA S.F. from line ad	cm/sec /pulse	5.847660		5.852340		
bc	Y PIPA S.F. from line ae	cm/sec /pulse	5.847660		5.852340		
bd	Z PIPA S.F. from line af	cm/sec /pulse	5.847660		5.852340		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC
NO. 12217
REV. G

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
be	X PIPA Bias from line ag	cm/sec^2	-0.5		+0.5		
bf	Y PIPA Bias from line ah	cm/sec^2	-0.5		+0.5		
bg	Z PIPA Bias from line ai	cm/sec^2	-0.5		+0.5		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 9

JDC
NO. 12217
REV. G

JOB IMU PERFORMANCE TEST

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4

JDC	PARAMETER	VALUE
16236	BDX	
16236	ADSRAX	
16237	ADIAX	
16239	BDY	
16239	ADSRAY	
16240	ADIAY	
16242	BDZ	
16242	ADSRAZ	
16243	ADIAZ	

Table 5

DATE 30 JUN 66

JOB IMU PERFORMANCE TEST | JDC 12217 REV. H PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 9

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The three IRIG coefficient terms, NBD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-
E	11-3-66	31779	4-6	2-6	EA	-
F	11-15-66	31938	-	1	EA	-
G	11-17-66	31932	3	-	EA	-
H	1-5-67	32494	1,2,5,6	1	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5 before proceeding with this JDC. 2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA Scale Factor Test within 0.2 hours of that time.

INITIALIZATION

1. Establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the SCOPE by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT

VERIFICATION WITH SIDL REQUIRED BEFORE USE

ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Set the PIP and IRIG S. F. MONITOR switch to OFF and perform the following DSKY operations:

VERB 57	ENTR
00001	ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3).

If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+18000	ENTR

To correct ROW 2 -

VERB 22	ENTR
Test site latitude from Table 3	ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00001	ENTR

+NBDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S.F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00002	ENTR

+NBDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDX+ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00003	ENTR

-NBDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S. F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00004	ENTR

+NBDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

JOB IMU PERFORMANCE TEST | JDC 12217 REV. H PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 9

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The three IRIG coefficient terms, NBD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-
E	11-3-66	31779	4-6	2-6	EA	-
F	11-15-66	31938	-	1	EA	-
G	11-17-66	31932	3	-	EA	-
H	1-5-67	32494	1,2,5,6	1	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5 before proceeding with this JDC. 2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA Scale Factor Test within 0.2 hours of that time.

INITIALIZATION

1. Establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the SCOPE by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT

VERIFICATION WITH SIDL REQUIRED BEFORE USE

ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Set the PIP and IRIG S. F. MONITOR switch to OFF and perform the following DSKY operations:

VERB 57 ENTR
00001 ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3).

If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+18000 ENTR
To correct ROW 2 -
VERB 22 ENTR
Test site latitude from Table 3 ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00001 ENTR

+NBDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00002 ENTR

+NBDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDX+ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00003 ENTR

-NBDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S. F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00004 ENTR

+NBDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

+NBDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

+NBDZ - ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+NBDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Y PIPA S. F. TEST

41. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDY + ADIAY

42. Calculate -NBDZ - ADSRAZ: line k-2 (line c).

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. Enter the calculated value of -NBDZ -ADSRAZ into the DSKY as ±XXX.XX and press the ENTR pushbutton.
e. If KEY REL indicator on DSKY flashes press KEY REL pushbutton.

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Perform calculations and complete data sheet.

48. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC
NO. 12217
REV. H
INITIAL TDRR 23832

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨		
2.a	X PIPA G/S output	Volts p-p	▨		15		
2.b	Y PIPA G/S output	Volts p-p	▨		15		
2.c	Z PIPA G/S output	Volts p-p	▨		15		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts dc	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+N BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	b
21	+N BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	d
23	-N BDX +ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e
26	-N BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	g

JOB IMU PERFORMANCE TEST | JDC 12217 REV H PAGE 5 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

+NBDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

+NBDZ - ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

DATE 30 JUN 66

JOB IMU PERFORMANCE TEST | JDC 12217 REV H PAGE 6 OF 6

SUBSYSTEM G & N SYSTEM | ASSY

To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+NBDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Y PIPA S. F. TEST

41. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDY + ADIAY

42. Calculate -NBDZ - ADSRAZ: line k-2 (line c).

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. Enter the calculated value of -NBDZ -ADSRAZ into the DSKY as ±XXX.XX and press the ENTR pushbutton.
e. If KEY REL indicator on DSKY flashes press KEY REL pushbutton.

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Perform calculations and complete data sheet.

48. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC NO. 12217
REV. H
INITIAL TDRR 2[illegible]882

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨		
2.a	X PIPA G/S output	Volts p-p	▨		15		
2.b	Y PIPA G/S output	Volts p-p	▨		15		
2.c	Z PIPA G/S output	Volts p-p	▨		15		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts dc	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+N BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	b
21	+N BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	d
23	-N BDX +ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e
26	-N BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	g

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+N BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	i
32	+N BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	j
36	+N BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.__	▨	▨	▨	k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	l
40	+N BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	m
41	-Y PIPA Test (ROW 1 indication) Position +00006 (Row 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	n

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	-NBDZ - ADSRAZ = line k - 2 (line c)	meru	▨	( )_____	▨	▨	▨	o
43	-N BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )_____	▨	▨	▨	p

LINE	CALCULATION	PARAMETER	UNITS
p.1	- line f =	NBDX	meru
p.2	line a	NBDY	meru
p.3	line c	NBDZ	meru
q	-1 [- line e + line f] = ( )	ADIAX	meru
r	line h - line a = ( )	ADSRAY	meru
s	+ line j - line c = ( )	ADIAZ	meru
t	- line k + line c = ( )	ADSRAZ	meru
u	line m + line f = ( )	ADSRAX	meru
v	line p + line a = ( )	ADIAY	meru
w	line b - line d = ( )	PIPA X 2G	cm/sec²
x	line l - line n = ( )	PIPA Y 2 G	cm/sec²
y	line g - line i = ( )	PIPA Z 2G	cm/sec²
z	Enter local gravity (Table 4)_.____		cm/sec²
aa	Nominal PIPA S. F. = 5.850000		cm/sec/pulse

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ab	Multiply line z by line aa =		
ac	2 times line ab =		
ad	line ac ÷ line w = Enter this value on line bb		
ae	line ac ÷ line x = Enter this value on line bc		
af	line ac ÷ line y = Enter this value on line bd		
ag	1/2 (line b + line d) = ( ) __.___ Enter this value on line be		
ah	1/2 (line l + line n) = ( ) _.___ Enter this value on line bf		
ai	1/2 (line i + line g) = ( ) __.___ Enter this value on line bg.		
	Perform the following calculations for values of Δ BD, Δ ADSRA, and ΔADIA. The constants are obtained from Table 5. Transfer results to items ar through az on data sheet.		
aj	ΔBDY = (line p.2) - (BDY) ΔBDY =		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ak	ΔBDZ = (+line p.3) - (BDZ) ΔBDZ =		
al	ΔBDX = (+line p.1) - (BDX) ΔBDX =		
am	ΔADSRAY = (line r) - (ADSRAY) ΔADSRAY =		
an	ΔADSRAZ = (line t) - (ADSRAZ) ΔADSRAZ =		
ao	ΔADSRAX = (line u) - (ADSRAX) ΔADSRAX =		
ap	ΔADIAX = (line q) - (ADIAX) ΔADIAX =		
aq	ΔADIAZ = (line s) - (ADIAZ) ΔADIAZ =		
ar	ΔADIAY = (line v) - (ADIAY) ΔADIAY =		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+N BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )__.___	▨	▨	▨	h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	i
32	+N BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )__.___	▨	▨	▨	j
36	+N BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )__.___	▨	▨	▨	k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	l
40	+N BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )__.___	▨	▨	▨	m
41	-Y PIPA Test (ROW 1 indication) Position +00006 (Row 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	n

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	-NBDZ - ADSRAZ = line k - 2 (line c)	meru	▨	( )__.___	▨	▨	▨	o
43	-N BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )__.___	▨	▨	▨	p

LINE	CALCULATION	PARAMETER	UNITS
p.1	- line f =	NBDX	meru
p.2	line a	NBDY	meru
p.3	line c	NBDZ	meru
q	-1 [- line e + line f] = ( )	ADIAX	meru
r	line h - line a = ( )	ADSRAY	meru
s	+ line j - line c = ( )	ADIAZ	meru
t	- line k + line c = ( )	ADSRAZ	meru
u	line m + line f = ( )	ADSRAX	meru
v	line p + line a = ( )	ADIAY	meru
w	line b - line d = ( )	PIPA X 2G	cm/sec²
x	line l - line n = ( )	PIPA Y 2 G	cm/sec²
y	line g - line i = ( )	PIPA Z 2G	cm/sec²
z	Enter local gravity (Table 4)__.___		cm/sec²
aa	Nominal PIPA S. F. = 5.850000		cm/sec/pulse

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ab	Multiply line z by line aa =		
ac	2 times line ab =		
ad	line ac + line w = Enter this value on line bb		
ae	line ac + line x = Enter this value on line bc		
af	line ac + line y = Enter this value on line bd		
ag	1/2 (line b + line d) = ( ) __.___ Enter this value on line be		
ah	1/2 (line l + line n) = ( ) __.___ Enter this value on line bf		
ai	1/2 (line i + line g) = ( ) __.___ Enter this value on line bg.		
	Perform the following calculations for values of Δ BD, Δ ADSRA, and ΔADIA. The constants are obtained from Table 5. Transfer results to items ar through az on data sheet.		
aj	ΔBDY = (line p. 2) - (BDY) ΔBDY =		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ak	ΔBDZ = (+line p. 3) - (BDZ) ΔBDZ =		
al	ΔBDX = (+line p. 1) - (BDX) ΔBDX =		
am	ΔADSRAY = (line r) - (ADSRAY) ΔADSRAY =		
an	ΔADSRAZ = (line t) - (ADSRAZ) ΔADSRAZ =		
ao	ΔADSRAX = (line u) - (ADSRAX) ΔADSRAX =		
ap	ΔADIAX = (line q) - (ADIAX) ΔADIAX =		
aq	ΔADIAZ = (line s) - (ADIAZ) ΔADIAZ =		
ar	ΔADIAY = (line v) - (ADIAY) ΔADIAY =		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
as	ΔBDY	meru	-5.0		+5.0		
at	ΔBDZ	meru	-5.0		+5.0		
au	ΔBDX	meru	-5.0		+5.0		
av	ΔADSRAY	meru	-10.0		+10.0		
aw	ΔADSRAZ	meru	-10.0		+10.0		
ax	ΔADSRAX	meru	-10.0		+10.0		
ay	Δ ADIAX	meru	-15.0		+15.0		
az	ΔADIAZ	meru	-15.0		+15.0		
ba	∠ADIAY	meru	-15.0		+15.0		
bb	X PIPA S.F. from line ad	cm/sec /pulse	5.847660		5.852340		
bc	Y PIPA S.F. from line ae	cm/sec /pulse	5.847660		5.852340		
bd	Z PIPA S.F. from line af	cm/sec /pulse	5.847660		5.852340		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
be	X PIPA Bias from line ag	cm/sec^2	-0.5		+0.5		
bf	Y PIPA Bias from line ah	cm/sec^2	-0.5		+0.5		
bg	Z PIPA Bias from line ai	cm/sec^2	-0.5		+0.5		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4

JDC	PARAMETER	VALUE
16236	BDX	
16236	ADSRAX	
16237	ADIAX	
16239	BDY	
16239	ADSRAY	
16240	ADIAY	
16242	BDZ	
16242	ADSRAZ	
16243	ADIAZ	

Table 5

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
as	ΔBDY	meru	-5.0		+5.0		
at	ΔBDZ	meru	-5.0		+5.0		
au	ΔBDX	meru	-5.0		+5.0		
av	ΔADSRAY	meru	-10.0		+10.0		
aw	ΔADSRAZ	meru	-10.0		+10.0		
ax	ΔADSRAX	meru	-10.0		+10.0		
ay	Δ ADIAX	meru	-15.0		+15.0		
az	ΔADIAZ	meru	-15.0		+15.0		
ba	∠ADIAY	meru	-15.0		+15.0		
bb	X PIPA S.F. from line ad	cm/sec /pulse	5.847660		5.852340		
bc	Y PIPA S.F. from line ae	cm/sec /pulse	5.847660		5.852340		
bd	Z PIPA S.F. from line af	cm/sec /pulse	5.847660		5.852340		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
be	X PIPA Bias from line ag	cm/sec²	-0.5		+0.5		
bf	Y PIPA Bias from line ah	cm/sec²	-0.5		+0.5		
bg	Z PIPA Bias from line ai	cm/sec²	-0.5		+0.5		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 9

JDC
NO. 12217
REV. H

JOB IMU PERFORMANCE TEST

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4

JDC	PARAMETER	VALUE
16236	BDX	
16236	ADSRAX	
16237	ADIAX	
16239	BDY	
16239	ADSRAY	
16240	ADIAY	
16242	BDZ	
16242	ADSRAZ	
16243	ADIAZ	

Table 5

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JOB IMU PERFORMANCE TEST

JDC 12217 REV. J PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS 40

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The three IRIG coefficient terms, BD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-
E	11-3-66	31779	4-6	2-6	EA	-
F	11-15-66	31938	-	1	EA	-
G	11-17-66	31932	3	-	EA	-
H	1-5-67	32494	1,2,5,6	1	EA	-
J	3-23-67	33377	All	All	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5. Record most recent historical values (up to three values) and test dates for coefficient terms BD, ADSRA, ADIA, Δ SF (A) and A_B from ISS testing and from any prior runs of this JDC.

2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not initialize a test position if less than 90 minutes remain before time of overflow.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the SCOPE by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

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Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Set the PIP and IRIG S. F. MONITOR switch to OFF and perform the following DSKY operations:

VERB 57 ENTR
00001 ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3). If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+18000 ENTR

To correct ROW 2 -
VERB 22 ENTR
Test site latitude from Table 3 ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR

To correct ROW 3 -
VERB 23 ENTR
+00001 ENTR

+BDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S.F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

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INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR

To correct ROW 3 -
VERB 23 ENTR
+00002 ENTR

+BDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S.F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-BDX + ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR

To correct ROW 3 -
VERB 23 ENTR
+00003 ENTR

-BDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S.F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900,

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ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00004 ENTR

+BDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

+BDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

+BDZ - ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN

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66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+BDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-BDY + ADIAY

41. Calculate -BDZ - ADSRAZ as shown on data sheet.

-Y PIPA S. F. TEST

42. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. Enter the calculated value of -BDZ -ADSRAZ into the DSKY as ±XXX.XX and press the ENTR pushbutton.
e. If KEY REL indicator on DSKY flashes press KEY REL pushbutton.

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Calculate coefficient terms BD, ADSRA, ADIA, ΔSF(A), and A_B. Record results.

48. Calculate coefficient stability terms D_1, D_2, and D_3 for each coefficient and record results as the initial values. (A total of four coefficient values are required in order to calculate a D_3 term.) If all stability term values are within the maximums given, record the results as the final values and proceed to the next step. If any

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stability term value exceeds the maximum given, retest the IMU by performing the retest sequence given in steps 50 through 55.

49. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

RETEST SEQUENCE

NOTE: The following steps are to be performed only if the stability values calculated in step 48 exceed maximum values on the initial run.

50. Repeat steps 1 through 47. Record results on data sheet spaces provided.

51. Perform JDC 12204 to downmode system to ISS Standby.

52. Perform JDC 12204 to advance system to ISS Operate.

53. Repeat steps 1 through 47.

54. Calculate coefficient stability terms D_1, D_2 and D_3 for each coefficient and record results as the final values.

55. Return to step 49.

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EQUIPMENT TEST
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INITIAL TDRR

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨	▨	▨
2.a	X PIPA G/S output	Volts p-p	▨		15		
2.b	Y PIPA G/S output	Volts p-p	▨		15		
2.c	Z PIPA G/S output	Volts p-p	▨		15		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts dc	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+BDY (ROW 2 indication) Position +00001	meru		( )___.__				a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²		( )______. ( )______				b
21	+BDZ (ROW 2 indication) Position +00002	meru		( )___.__				c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²		( )______. ( )______				d
23	-BDX + ADIAX (ROW 2 indication) Position +00002	meru		( )___.__				e
26	-BDX (ROW 2 indication) Position +00003	meru		( )___.__				f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²		( )______. ( )______				g

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru		( )___.__				h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec²		( )______. ( )______				i
32	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru		( )___.__				j
36	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru		( )___.__				k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec²		( )______. ( )______				m
40	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru		( )___.__				n
41	-BDZ - ADSRAZ = (line k) -2 (line c)	meru		( )___.__				p

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	-Y PIPA Test (ROW 1 indication) Position +00006 (ROW 2 indication)	cm/sec²		( )______. ( )______				q
43	-BDY + ADIAY (ROW 2 indication) Position +00006	meru		( )___.__				r

JDC ITEM NO.	CALCULATIONS	
47.a	$BD_X = -$ (line f) = ( )	meru
47.b	$BD_Y =$ line a = ( )	meru
47.c	$BD_Z =$ line c = ( )	meru
47.d	$ADSRA_X =$ line n + line f = ( )	meru/g
47.e	$ADSRA_Y =$ line h - line a = ( )	meru/g
47.f	$ADSRA_Z = -$ (line k) + line c = ( )	meru/g

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JDC ITEM NO.	CALCULATIONS	
47.g	$ADIA_X = -1\left[-(\text{line e}) + (\text{line f})\right] = (\ )$	meru/g
47.h	$ADIA_Y =$ line r + line a = ( )	meru/g
47.i	$ADIA_Z =$ line j - line c = ( )	meru/g
47.j	g = ___.__ , (Enter local gravity from Table 4)	cm/sec²
	$SF(A)_X = \dfrac{2g \times 5.850000}{\text{line b} - \text{line d}}$	cm/sec/pulse
	$\Delta\, SF(A)_X = \dfrac{\left[SF(A)_X - 5.85\right] \times 10^6}{5.85}$	ppm
47.k	$SF(A)_Y = \dfrac{2g \times 5.850000}{\text{line m} - \text{line q}}$	cm/sec/pulse
	$\Delta\, SF(A)_Y = \dfrac{\left[SF(A)_Y - 5.85\right] \times 10^6}{5.85}$	ppm

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JDC ITEM NO.	CALCULATIONS
47.1	$SF(A)_Z = \frac{2g \times 5.850000}{\text{line g} - \text{line i}}$ cm/sec/pulse
	$\Delta SF(A)_Z = \frac{\left[SF(A)_Z - 5.85\right] \times 10^6}{5.85}$ ppm
47.m	$A_{B_X} = \frac{\text{line b} + \text{line d}}{2}$ cm/sec^2
47.n	$A_{B_Y} = \frac{\text{line m} + \text{line q}}{2}$ cm/sec^2
47.o	$A_{B_Z} = \frac{\text{line i} + \text{line g}}{2}$ cm/sec^2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47.a	B_{D_X}	meru	-15.0		+15.0			s
47.b	B_{D_Y}	meru	-15.0		+15.0			t
47.c	B_{D_Z}	meru	-15.0		+15.0			u
47.d	$ADSRA_X$	meru/g	-40.0		+40.0			v
47.e	$ADSRA_Y$	meru/g	-40.0		+40.0			w
47.f	$ADSRA_Z$	meru/g	-40.0		+40.0			x
47.g	$ADIA_X$	meru/g	-100		+100			y
47.h	$ADIA_Y$	meru/g	-100		+100			z
47.i	$ADIA_Z$	meru/g	-100		+100			aa
47.j	$\Delta SF(A)_X$	ppm	-1900		+1900			ab
47.k	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac
47.l	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad
47.m	A_{B_X}	cm/sec^2	-2.20		+2.20			ae
47.n	A_{B_Y}	cm/sec^2	-2.20		+2.20			af
47.o	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag

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JDC ITEM NO.	CALCULATIONS
48.a	$BD_XD_1 = \lvert \text{line ah} - \text{line s} \rvert$ meru
	$BD_XD_2 = D_1 + \lvert \text{line ai} - \text{line ah} \rvert$ meru
	$BD_XD_3 = D_2 + \lvert \text{line aj} - \text{line ai} \rvert$ meru
48.b	$BD_YD_1 = \lvert \text{line as} - \text{line t} \rvert$ meru
	$BD_YD_2 = D_1 + \lvert \text{line at} - \text{line as} \rvert$ meru
	$BD_YD_3 = D_2 + \lvert \text{line au} - \text{line at} \rvert$ meru
48.c	$BD_ZD_1 = \lvert \text{line bb} - \text{line u} \rvert$ meru
	$BD_ZD_2 = D_1 + \lvert \text{line bc} - \text{line bb} \rvert$ meru
	$BD_ZD_3 = D_2 + \lvert \text{line bd} - \text{line bc} \rvert$ meru

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JDC ITEM NO.	CALCULATIONS
48.d	$ADSRA_XD_1 = \lvert \text{line ak} - \text{line v} \rvert$ meru/g
	$ADSRA_XD_2 = D_1 + \lvert \text{line am} - \text{line ak} \rvert$ meru/g
	$ADSRA_XD_3 = D_2 + \lvert \text{line an} - \text{line am} \rvert$ meru/g
48.e	$ADSRA_YD_1 = \lvert \text{line av} - \text{line w} \rvert$ meru/g
	$ADSRA_YD_2 = D_1 + \lvert \text{line aw} - \text{line av} \rvert$ meru/g
	$ADSRA_YD_3 = D_2 + \lvert \text{line ax} - \text{line aw} \rvert$ meru/g
48.f	$ADSRA_ZD_1 = \lvert \text{line be} - \text{line x} \rvert$ meru/g
	$ADSRA_ZD_2 = D_1 + \lvert \text{line bf} - \text{line be} \rvert$ meru/g
	$ADSRA_ZD_3 = D_2 + \lvert \text{line bg} - \text{line bf} \rvert$ meru/g

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JDC ITEM NO.	CALCULATIONS
48.g	$ADIA_XD_1 = \lvert \text{line ap - line y} \rvert$ meru/g
	$ADIA_XD_2 = D_1 + \lvert \text{line aq - line ap} \rvert$ meru/g
	$ADIA_XD_3 = D_2 + \lvert \text{line ar - line aq} \rvert$ meru/g
48.h	$ADIA_YD_1 = \lvert \text{line ay - line z} \rvert$ meru/g
	$ADIA_YD_2 = D_1 + \lvert \text{line az - line ay} \rvert$ meru/g
	$ADIA_YD_3 = D_2 + \lvert \text{line ba - line az} \rvert$ meru/g
48.i	$ADIA_ZD_1 = \lvert \text{line bh - line aa} \rvert$ meru/g
	$ADIA_ZD_2 = D_1 + \lvert \text{line bi - line bh} \rvert$ meru/g
	$ADIA_ZD_3 = D_2 + \lvert \text{line bj - line bi} \rvert$ meru/g

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS
48.j	$\Delta\ SF(A)_XD_1 = \lvert \text{line bk - line ab} \rvert$ ppm
	$\Delta\ SF(A)_XD_2 = D_1 + \lvert \text{line bm - line bk} \rvert$ ppm
	$\Delta\ SF(A)_XD_3 = D_2 + \lvert \text{line bn - line bm} \rvert$ ppm
48.k	$\Delta\ SF(A)_YD_1 = \lvert \text{line bs - line ac} \rvert$ ppm
	$\Delta\ SF(A)_YD_2 = D_1 + \lvert \text{line bt - line bs} \rvert$ ppm
	$\Delta\ SF(A)_YD_3 = D_2 + \lvert \text{line bu - line bt} \rvert$ ppm
48.l	$\Delta\ SF(A)_ZD_1 = \lvert \text{line by - line ad} \rvert$ ppm
	$\Delta\ SF(A)_ZD_2 = D_1 + \lvert \text{line bz - line by} \rvert$ ppm
	$\Delta\ SF(A)_ZD_3 = D_2 + \lvert \text{line ca - line bz} \rvert$ ppm

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JDC ITEM NO.	CALCULATIONS
48.m	$A_{B_X}D_1 = \lvert \text{line bp - line ae} \rvert$ cm/sec^2
	$A_{B_X}D_2 = D_1 + \lvert \text{line bq - line bp} \rvert$ cm/sec^2
	$A_{B_X}D_3 = D_2 + \lvert \text{line br - line bq} \rvert$ cm/sec^2
48.n	$A_{B_Y}D_1 = \lvert \text{line bv - line af} \rvert$ cm/sec^2
	$A_{B_Y}D_2 = D_1 + \lvert \text{line bw - line bv} \rvert$ cm/sec^2
	$A_{B_Y}D_3 = D_2 + \lvert \text{line bx - line bw} \rvert$ cm/sec^2
48.o	$A_{B_Z}D_1 = \lvert \text{line cb - line ag} \rvert$ cm/sec^2
	$A_{B_Z}D_2 = D_1 + \lvert \text{line cc - line cb} \rvert$ cm/sec^2
	$A_{B_Z}D_3 = D_2 + \lvert \text{line cd - line cc} \rvert$ cm/sec^2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.a	Initial BD_XD_1	meru	▨		6.0	▨	▨
	Initial BD_XD_2	meru	▨		9.0	▨	▨
	Initial BD_XD_3	meru	▨		11.0	▨	▨
48.a	Final BD_XD_1	meru	▨		6.0		
or	Final BD_XD_2	meru	▨		9.0		
54.a	Final BD_XD_3	meru	▨		11.0		
48.b	Initial BD_YD_1	meru	▨		6.0	▨	▨
	Initial BD_YD_2	meru	▨		9.0	▨	▨
	Initial BD_YD_3	meru	▨		11.0	▨	▨
48.b	Final BD_YD_1	meru	▨		6.0		
or	Final BD_YD_2	meru	▨		9.0		
54.b	Final BD_YD_3	meru	▨		11.0		
48.c	Initial BD_ZD_1	meru	▨		6.0	▨	▨
	Initial BD_ZD_2	meru	▨		9.0	▨	▨
	Initial BD_ZD_3	meru	▨		11.0	▨	▨
48.c	Final BD_ZD_1	meru	▨		6.0		
or	Final BD_ZD_2	meru	▨		9.0		
54.c	Final BD_ZD_3	meru	▨		11.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.d	Initial $\mathrm{ADSRA}_X\mathrm{D}_1$	meru/g	▨		14.0	▨	▨
	Initial $\mathrm{ADSRA}_X\mathrm{D}_2$	meru/g	▨		21.0	▨	▨
	Initial $\mathrm{ADSRA}_X\mathrm{D}_3$	meru/g	▨		25.0	▨	▨
48.d	Final $\mathrm{ADSRA}_X\mathrm{D}_1$	meru/g	▨		14.0		
or	Final $\mathrm{ADSRA}_X\mathrm{D}_2$	meru/g	▨		21.0		
54.d	Final $\mathrm{ADSRA}_X\mathrm{D}_3$	meru/g	▨		25.0		
48.e	Initial $\mathrm{ADSRA}_Y\mathrm{D}_1$	meru/g	▨		14.0	▨	▨
	Initial $\mathrm{ADSRA}_Y\mathrm{D}_2$	meru/g	▨		21.0	▨	▨
	Initial $\mathrm{ADSRA}_Y\mathrm{D}_3$	meru/g	▨		25.0	▨	▨
48.e	Final $\mathrm{ADSRA}_Y\mathrm{D}_1$	meru/g	▨		14.0		
or	Final $\mathrm{ADSRA}_Y\mathrm{D}_2$	meru/g	▨		21.0		
54.e	Final $\mathrm{ADSRA}_Y\mathrm{D}_3$	meru/g	▨		25.0		
48.f	Initial $\mathrm{ADSRA}_Z\mathrm{D}_1$	meru/g	▨		14.0	▨	▨
	Initial $\mathrm{ADSRA}_Z\mathrm{D}_2$	meru/g	▨		21.0	▨	▨
	Initial $\mathrm{ADSRA}_Z\mathrm{D}_3$	meru/g	▨		25.0	▨	▨
48.f	Final $\mathrm{ADSRA}_Z\mathrm{D}_1$	meru/g	▨		14.0		
or	Final $\mathrm{ADSRA}_Z\mathrm{D}_2$	meru/g	▨		21.0		
54.f	Final $\mathrm{ADSRA}_Z\mathrm{D}_3$	meru/g	▨		25.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.g	Initial $\mathrm{ADIA}_X\mathrm{D}_1$	meru/g	▨		17.0	▨	▨
	Initial $\mathrm{ADIA}_X\mathrm{D}_2$	meru/g	▨		33.0	▨	▨
	Initial $\mathrm{ADIA}_X\mathrm{D}_3$	meru/g	▨		40.0	▨	▨
48.g	Final $\mathrm{ADIA}_X\mathrm{D}_1$	meru/g	▨		17.0		
or	Final $\mathrm{ADIA}_X\mathrm{D}_2$	meru/g	▨		33.0		
54.g	Final $\mathrm{ADIA}_X\mathrm{D}_3$	meru/g	▨		40.0		
48.h	Initial $\mathrm{ADIA}_Y\mathrm{D}_1$	meru/g	▨		17.0	▨	▨
	Initial $\mathrm{ADIA}_Y\mathrm{D}_2$	meru/g	▨		33.0	▨	▨
	Initial $\mathrm{ADIA}_Y\mathrm{D}_3$	meru/g	▨		40.0	▨	▨
48.h	Final $\mathrm{ADIA}_Y\mathrm{D}_1$	meru/g	▨		17.0		
or	Final $\mathrm{ADIA}_Y\mathrm{D}_2$	meru/g	▨		33.0		
54.h	Final $\mathrm{ADIA}_Y\mathrm{D}_3$	meru/g	▨		40.0		
48.i	Initial $\mathrm{ADIA}_Z\mathrm{D}_1$	meru/g	▨		17.0	▨	▨
	Initial $\mathrm{ADIA}_Z\mathrm{D}_2$	meru/g	▨		33.0	▨	▨
	Initial $\mathrm{ADIA}_Z\mathrm{D}_3$	meru/g	▨		40.0	▨	▨
48.i	Final $\mathrm{ADIA}_Z\mathrm{D}_1$	meru/g	▨		17.0		
or	Final $\mathrm{ADIA}_Z\mathrm{D}_2$	meru/g	▨		33.0		
54.i	Final $\mathrm{ADIA}_Z\mathrm{D}_3$	meru/g	▨		40.0		

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JDC
NO. 12217
REV. J

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.j	Initial $\Delta\mathrm{SF(A)}_X\mathrm{D}_1$	ppm	▨		400	▨	▨
	Initial $\Delta\mathrm{SF(A)}_X\mathrm{D}_2$	ppm	▨		500	▨	▨
	Initial $\Delta\mathrm{SF(A)}_X\mathrm{D}_3$	ppm	▨		600	▨	▨
48.j	Final $\Delta\mathrm{SF(A)}_X\mathrm{D}_1$	ppm	▨		400		
or	Final $\Delta\mathrm{SF(A)}_X\mathrm{D}_2$	ppm	▨		500		
54.j	Final $\Delta\mathrm{SF(A)}_X\mathrm{D}_3$	ppm	▨		600		
48.k	Initial $\Delta\mathrm{SF(A)}_Y\mathrm{D}_1$	ppm	▨		400	▨	▨
	Initial $\Delta\mathrm{SF(A)}_Y\mathrm{D}_2$	ppm	▨		500	▨	▨
	Initial $\Delta\mathrm{SF(A)}_Y\mathrm{D}_3$	ppm	▨		600	▨	▨
48.k	Final $\Delta\mathrm{SF(A)}_Y\mathrm{D}_1$	ppm	▨		400		
or	Final $\Delta\mathrm{SF(A)}_Y\mathrm{D}_2$	ppm	▨		500		
54.k	Final $\Delta\mathrm{SF(A)}_Y\mathrm{D}_3$	ppm	▨		600		
48.l	Initial $\Delta\mathrm{SF(A)}_Z\mathrm{D}_1$	ppm	▨		400	▨	▨
	Initial $\Delta\mathrm{SF(A)}_Z\mathrm{D}_2$	ppm	▨		500	▨	▨
	Initial $\Delta\mathrm{SF(A)}_Z\mathrm{D}_3$	ppm	▨		600	▨	▨
48.l	Final $\Delta\mathrm{SF(A)}_Z\mathrm{D}_1$	ppm	▨		400		
or	Final $\Delta\mathrm{SF(A)}_Z\mathrm{D}_2$	ppm	▨		500		
54.l	Final $\Delta\mathrm{SF(A)}_Z\mathrm{D}_3$	ppm	▨		600		

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JDC
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REV. J

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.m	Initial $A_{B_X}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_X}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_X}D_3$	cm/sec^2	▨		0.90	▨	▨
48.m	Final $A_{B_X}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_X}D_2$	cm/sec^2	▨		0.70		
54.m	Final $A_{B_X}D_3$	cm/sec^2	▨		0.90		
48.n	Initial $A_{B_Y}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_Y}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_Y}D_3$	cm/sec^2	▨		0.90	▨	▨
48.n	Final $A_{B_Y}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_Y}D_2$	cm/sec^2	▨		0.70		
54.n	Final $A_{B_Y}D_3$	cm/sec^2	▨		0.90		
48.o	Initial $A_{B_Z}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_Z}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_Z}D_3$	cm/sec^2	▨		0.90	▨	▨

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JOB IMU PERFORMANCE TEST

JDC
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.o	Final $A_{B_Z}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_Z}D_2$	cm/sec^2	▨		0.70		
54.o	Final $A_{B_Z}D_3$	cm/sec^2	▨		0.90		
50 (1)	Gyro WHEEL	Time	▨		▨	▨	▨
50 (2.a)	X PIPA G/S output	Volts p-p	▨		15		
50 (2.b)	Y PIPA G/S output	Volts p-p	▨		15		
50 (2.c)	Z PIPA G/S output	Volts p-p	▨		15		
50 (6.f.1)	X PIPA PVR	Volts dc	5.94		6.06		
50 (6.f.2)	Y PIPA PVR	Volts dc	5.94		6.06		
50 (6.f.3)	Z PIPA PVR	Volts dc	5.94		6.06		
50 (11)	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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JDC
NO. 12217
REV. J

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (17)	+BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a.1
50 (18)	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	b.1
50 (21)	+BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c.1
50 (22)	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	d.1
50 (23)	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e.1
50 (26)	-BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f.1
50 (27)	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	g.1

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JDC
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REV. J

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (30)	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	h.1
50 (31)	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	i.1
50 (32)	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	j.1
50 (36)	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.__	▨	▨	▨	k.1
50 (37)	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	m.1
50 (40)	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	n.1
50 (41)	-BDZ - ADSRAZ = (line k.1) -2 (line c.1) =	meru	▨	( )___.__	▨	▨	▨	p.1

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JDC
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (42)	-Y PIPA Test (ROW 1 indication) Position + 00006 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	q.1
50 (43)	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	r.1

JDC ITEM NO.	CALCULATIONS
50 (47.a)	BD_X = - (line f.1) = ( ) meru
50 (47.b)	BD_Y = line a.1 = ( ) meru
50 (47.c)	BD_Z = line c.1 = ( ) meru
50 (47.d)	$ADSRA_X$ = line n.1 + line f.1 = ( ) meru/g
50 (47.e)	$ADSRA_Y$ = line h.1 - line a.1 = ( ) meru/g

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JDC
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
50 (47.f)	$ADSRA_Z = -(\text{line k.1}) + \text{line c.1} = (\ \ )$	meru/g
50 (47.g)	$ADIA_X = -1\ \left[(\text{line e.1}) + (\text{line f.1})\right] = (\ \ )$	meru/g
50 (47.h)	$ADIA_Y = \text{line r.1} + \text{line a.1} = (\ \ )$	meru/g
50 (47.i)	$ADIA_Z = \text{line j.1} - \text{line c.1} = (\ \ )$	meru/g
50 (47.j)	g = ___ . __ (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \dfrac{2g \times 5.850000}{\text{line b.1} - \text{line d.1}}$	cm/sec/pulse
	$\Delta SF(A)_X = \dfrac{\left[SF(A)_X - 5.85\right] \times 10^6}{5.85}$	ppm

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JDC ITEM NO.	CALCULATIONS	
50 (47.k)	$SF(A)_Y = \dfrac{2g \times 5.850000}{\text{line m.1} - \text{line q.1}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \dfrac{\left[SF(A)_Y - 5.85\right] \times 10^6}{5.85}$	ppm
50 (47.l)	$SF(A)_Z = \dfrac{2g \times 5.850000}{\text{line g.1} - \text{line i.1}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \dfrac{\left[SF(A)_Z - 5.85\right] \times 10^6}{5.85}$	ppm
50 (47.m)	$A_{B_X} = \dfrac{\text{line b.1} + \text{line d.1}}{2}$	cm/sec^2
50 (47.n)	$A_{B_Y} = \dfrac{\text{line m.1} + \text{line q.1}}{2}$	cm/sec^2
50 (47.o)	$A_{B_Z} = \dfrac{\text{line i.1} + \text{line g.1}}{2}$	cm/sec^2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (47.a)	B_{D_X}	meru	-15.0		+15.0			s.1
50 (47.b)	B_{D_Y}	meru	-15.0		+15.0			t.1
50 (47.c)	B_{D_Z}	meru	-15.0		+15.0			u.1
50 (47.d)	$ADSRA_X$	meru/g	-40.0		+40.0			v.1
50 (47.e)	$ADSRA_Y$	meru/g	-40.0		+40.0			w.1
50 (47.f)	$ADSRA_Z$	meru/g	-40.0		+40.0			x.1
50 (47.g)	$ADIA_X$	meru/g	-100		+100			y.1
50 (47.h)	$ADIA_Y$	meru	-100		+100			z.1
50 (47.i)	$ADIA_Z$	meru/g	-100		+100			aa.1
50 (47.j)	$\Delta SF(A)_X$	ppm	-1900		+1900			ab.1
50 (47.k)	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac.1
50 (47.l)	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad.1

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (47.m)	A_{B_X}	cm/sec^2	-2.20		+2.20			ae.1
50 (47.n)	A_{B_Y}	cm/sec^2	-2.20		+2.20			af.1
50 (47.o)	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag.1
53 (1)	Gyro WHEEL	Time	▨		▨	▨	▨	
53 (2.a)	X PIPA G/S output	Volts p-p	▨		15			
53 (2.b)	Y PIPA G/S output	Volts p-p	▨		15			
53 (2.c)	Z PIPA G/S output	Volts p-p	▨		15			
53 (6.f.1)	X PIPA PVR	Volts dc	5.94		6.06			
53 (6.f.2)	Y PIPA PVR	Volts dc	5.94		6.06			
53 (6.f.3)	Z PIPA PVR	Volts dc	5.94		6.06			
53 (11)	X PIPA TCM	Volts dc	0.98		1.08			
	Y PIPA TCM	Volts dc	0.98		1.08			

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (11) (cont)	Z PIPA TCM	Volts dc	0.98		1.08			
53 (17)	+BDY (ROW 2 indication) Position +00001	meru		( ) ___.__				a.2
53 (18)	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2		( ) _____. ( ) _____				b.2
53 (21)	+BDZ (ROW 2 indication) Position +00002	meru		( ) ___.__				c.2
53 (22)	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2		( ) _____. ( ) _____				d.2
53 (23)	-BDX + ADIAX (ROW 2 indication) Position +00002	meru		( ) ___.__				e.2
53 (26)	-BDX (ROW 2 indication) Position +00003	meru		( ) ___.__				f.2

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JDC NO. 12217
REV J

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (27)	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2		( ) _____. ( ) _____				g.2
53 (30)	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru		( ) ___.__				h.2
53 (31)	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2		( ) _____. ( ) _____				i.2
53 (32)	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru		( ) ___.__				j.2
53 (36)	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru		( ) ___.__				k.2
53 (37)	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2		( ) _____. ( ) _____				m.2
53 (40)	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru		( ) ___.__				n.2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (41)	-BDZ - ADSRAZ = (line k.2) -2 (line c.2) =	meru		( ) ___.__				p.2
53 (42)	-Y PIPA Test (ROW 1 indication) Position +00006 (ROW 2 indication)	cm/sec^2		( ) _____. ( ) _____				q.2
53 (43)	-BDY + ADIAY (ROW 2 indication) Position +00006	meru		( ) ___.__				r.2

JDC ITEM NO.	CALCULATIONS	
53 (47.a)	$BD_X = -$ (line f.2) = ( )	meru
53 (47.b)	$BD_Y =$ line a.2 = ( )	meru
53 (47.c)	$BD_Z =$ line c.2 = ( )	meru
53 (47.d)	$ADSRA_X =$ line n.2 + line f.2 = ( )	meru/g

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JDC ITEM NO.	CALCULATIONS	
53 (47.e)	$ADSRA_Y =$ line h.2 - line a.2 = ( )	meru/g
53 (47.f)	$ADSRA_Z = -$ (line k.2) + line c.2 = ( )	meru/g
53 (47.g)	$ADIA_X = -1 \left[-\text{(line e.2)} + \text{(line f.2)} \right] = (\ )$	meru/g
53 (47.h)	$ADIA_Y =$ line r.2 + line a.2 = ( )	meru/g
53 (47.i)	$ADIA_Z =$ line j.2 - line c.2 = ( )	meru/g
53 (47.j)	g = ___.__ (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \dfrac{2g \times 5.850000}{\text{line b.2 - line d.2}}$	cm/sec/pulse
	$\Delta SF(A)_X = \dfrac{\left[SF(A)_X - 5.85 \right] \times 10^6}{5.85}$	ppm

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JDC ITEM NO.	CALCULATIONS	
53 (47.k)	$SF(A)_Y = \dfrac{2g \times 5.850000}{\text{line m.2 - line q.2}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \dfrac{\left[SF(A)_Y - 5.85\right] \times 10^6}{5.85}$	ppm
53 (47.l)	$SF(A)_Z = \dfrac{2g \times 5.850000}{\text{line g.2 - line i.2}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \dfrac{\left[SF(A)_Z - 5.85\right] \times 10^6}{5.85}$	ppm
53 (47.m)	$A_{B_X} = \dfrac{\text{line b.2 + line d.2}}{2}$	cm/sec^2
53 (47.n)	$A_{B_Y} = \dfrac{\text{line m.2 + line q.2}}{2}$	cm/sec^2
53 (47.o)	$A_{B_Z} = \dfrac{\text{line i.2 + line g.2}}{2}$	cm/sec^2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (47.a)	B_{D_X}	meru	-15.0		+15.0			s.2
53 (47.b)	B_{D_Y}	meru	-15.0		+15.0			t.2
53 (47.c)	B_{D_Z}	meru	-15.0		+15.0			u.2
53 (47.d)	$ADSRA_X$	meru/g	-40.0		+40.0			v.2
53 (47.e)	$ADSRA_Y$	meru/g	-40.0		+40.0			w.2
53 (47.f)	$ADSRA_Z$	meru/g	-40.0		+40.0			x.2
53 (47.g)	$ADIA_X$	meru/g	-100		+100			y.2
53 (47.h)	$ADIA_Y$	meru/g	-100		+100			z.2
53 (47.i)	$ADIA_Z$	meru/g	-100		+100			aa.2
53 (47.j)	$\Delta SF(A)_X$	ppm	-1900		+1900			ab.2
53 (47.k)	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac.2
53 (47.l)	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad.2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (47.m)	A_{B_X}	cm/sec^2	-2.20		+2.20			ae.2
53 (47.n)	A_{B_Y}	cm/sec^2	-2.20		+2.20			af.2
53 (47.o)	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag.2

JDC ITEM NO.	CALCULATIONS	
54.a	$BD_XD_1 = \lvert \text{line s.1 - line s.2} \rvert$	meru
	$BD_XD_2 = D_1 + \lvert \text{line s - line s.1} \rvert$	meru
	$BD_XD_3 = D_2 + \lvert \text{line ah - line s} \rvert$	meru
54.b	$BD_YD_1 = \lvert \text{line t.1 - line t.2} \rvert$	meru
	$BD_YD_2 = D_1 + \lvert \text{line t - line t.1} \rvert$	meru
	$BD_YD_3 = D_2 + \lvert \text{line as - line t} \rvert$	meru

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JDC ITEM NO.	CALCULATIONS	
54.c	$BD_ZD_1 = \lvert \text{line u.1 - line u.2} \rvert$	meru
	$BD_ZD_2 = D_1 + \lvert \text{line u - line u.1} \rvert$	meru
	$BD_ZD_3 = D_2 + \lvert \text{line bb - line u} \rvert$	meru
54.d	$ADSRA_XD_1 = \lvert \text{line v.1 - line v.2} \rvert$	meru/g
	$ADSRA_XD_2 = D_1 + \lvert \text{line v - line v.1} \rvert$	meru/g
	$ADSRA_XD_3 = D_2 + \lvert \text{line ak - line v} \rvert$	meru/g
54.e	$ADSRA_YD_1 = \lvert \text{line w.1 - line w.2} \rvert$	meru/g
	$ADSRA_YD_2 = D_1 + \lvert \text{line w - line w.1} \rvert$	meru/g
	$ADSRA_YD_3 = D_2 + \lvert \text{line av - line w} \rvert$	meru/g

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JDC ITEM NO.	CALCULATIONS	
54.f	$\mathrm{ADSRA}_Z D_1 = \lvert \text{line x.1 - line x.2} \rvert$	meru/g
	$\mathrm{ADSRA}_Z D_2 = D_1 + \lvert \text{line x - line x.1} \rvert$	meru/g
	$\mathrm{ADSRA}_Z D_3 = D_2 + \lvert \text{line be - line x} \rvert$	meru/g
54.g	$\mathrm{ADIA}_X D_1 = \lvert \text{line y.1 - line y.2} \rvert$	meru/g
	$\mathrm{ADIA}_X D_2 = D_1 + \lvert \text{line y - line y.1} \rvert$	meru/g
	$\mathrm{ADIA}_X D_3 = D_2 + \lvert \text{line ap - line y} \rvert$	meru/g
54.h	$\mathrm{ADIA}_Y D_1 = \lvert \text{line z.1 - line z.2} \rvert$	meru/g
	$\mathrm{ADIA}_Y D_2 = D_1 + \lvert \text{line z - line z.1} \rvert$	meru/g
	$\mathrm{ADIA}_Y D_3 = D_2 + \lvert \text{line ay - line z} \rvert$	meru/g

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JDC NO. 12217
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JDC ITEM NO.	CALCULATIONS	
54.i	$\mathrm{ADIA}_Z D_1 = \lvert \text{line aa.1 - line aa.2} \rvert$	meru/g
	$\mathrm{ADIA}_Z D_2 = D_1 + \lvert \text{line aa - line aa.1} \rvert$	meru/g
	$\mathrm{ADIA}_Z D_3 = D_2 + \lvert \text{line bh - line aa} \rvert$	meru/g
54.j	$\Delta \mathrm{SF(A)}_X D_1 = \lvert \text{line ab.1 - line ab.2} \rvert$	ppm
	$\Delta \mathrm{SF(A)}_X D_2 = D_1 + \lvert \text{line ab - line ab.1} \rvert$	ppm
	$\Delta \mathrm{SF(A)}_X D_3 = D_2 + \lvert \text{line bk - line ab} \rvert$	ppm
54.k	$\Delta \mathrm{SF(A)}_Y D_1 = \lvert \text{line ac.1 - line ac.2} \rvert$	ppm
	$\Delta \mathrm{SF(A)}_Y D_2 = D_1 + \lvert \text{line ac - line ac.1} \rvert$	ppm
	$\Delta \mathrm{SF(A)}_Y D_3 = D_2 + \lvert \text{line be - line ac} \rvert$	ppm

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DATA SHEET 36 OF 40

JDC NO. 12217
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
54.l	$\Delta \mathrm{SF(A)}_Z D_1 = \lvert \text{line ad.1 - line ad.2} \rvert$	ppm
	$\Delta \mathrm{SF(A)}_Z D_2 = D_1 + \lvert \text{line ad - line ad.1} \rvert$	ppm
	$\Delta \mathrm{SF(A)}_Z D_3 = D_2 + \lvert \text{line by - line ad} \rvert$	ppm
54.m	$A_{B_X} D_1 = \lvert \text{line ae.1 - line ae.2} \rvert$	$\mathrm{cm/sec}^2$
	$A_{B_X} D_2 = D_1 + \lvert \text{line ae - line ae.1} \rvert$	$\mathrm{cm/sec}^2$
	$A_{B_X} D_3 = D_2 + \lvert \text{line bp - line ae} \rvert$	$\mathrm{cm/sec}^2$
54.n	$A_{B_Y} D_1 = \lvert \text{line af.1 - line af.2} \rvert$	$\mathrm{cm/sec}^2$
	$A_{B_Y} D_2 = D_1 + \lvert \text{line af - line af.1} \rvert$	$\mathrm{cm/sec}^2$
	$A_{B_Y} D_3 = D_2 + \lvert \text{line bv - line af} \rvert$	$\mathrm{cm/sec}^2$

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JDC NO. 12217
REV. J

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
54.o	$A_{B_Z} D_1 = \lvert \text{line ag.1 - line ag.2} \rvert$	$\mathrm{cm/sec}^2$
	$A_{B_Z} D_2 = D_1 + \lvert \text{line ag - line ag.1} \rvert$	$\mathrm{cm/sec}^2$
	$A_{B_Z} D_3 = D_2 + \lvert \text{line cb - line ag} \rvert$	$\mathrm{cm/sec}^2$

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4.

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APOLLO G&N
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JDC
NO. 12217
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JOB IMU PERFORMANCE TEST

JDC		VALUE	TEST DATE	
16236	(EXAMPLE) Last Historical BD_X	+1.46	3/8/67	
and	(EXAMPLE) Second Last Historical BD_X	+1.09	2/15/67	
12217	(EXAMPLE) Third Last Historical BD_X	-0.29	1/24/67	
16236	Last Historical BD_X			ah
and	Second Last Historical BD_X			ai
12217	Third Last Historical BD_X			aj
16236	Last Historical $ADSRA_X$			ak
and	Second Last Historical $ADSRA_X$			am
12217	Third Last Historical $ADSRA_X$			an
16237	Last Historical $ADIA_X$			ap
and	Second Last Historical $ADIA_X$			aq
12217	Third Last Historical $ADIA_X$			ar
16239	Last Historical BD_Y			as
and	Second Last Historical BD_Y			at
12217	Third Last Historical BD_Y			au

Table 5

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 39 **OF** 40

JDC
NO. 12217
REV. J

JOB IMU PERFORMANCE TEST

JDC		VALUE	TEST DATE	
16239	Last Historical $ADSRA_Y$			av
and	Second Last Historical $ADSRA_Y$			aw
12217	Third Last Historical $ADSRA_Y$			ax
16240	Last Historical $ADIA_Y$			ay
and	Second Last Historical $ADIA_Y$			az
12217	Third Last Historical $ADIA_Y$			ba
16242	Last Historical BD_Z			bb
and	Second Last Historical BD_Z			bc
12217	Third Last Historical BD_Z			bd
16242	Last Historical $ADSRA_Z$			be
and	Second Last Historical $ADSRA_Z$			bf
12217	Third Last Historical $ADSRA_Z$			bg
16243	Last Historical $ADIA_Z$			bh
and	Second Last Historical $ADIA_Z$			bi
12217	Third Last Historical $ADIA_Z$			bj
14201	Last Historical $\Delta SF(A)_X$			bk
and	Second Last Historical $\Delta SF(A)_X$			bm
12217	Third Last Historical $\Delta SF(A)_X$			bn

Table 5 (cont)

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12217
REV.

JOB IMU PERFORMANCE TEST

JDC		VALUE	TEST DATE	
14201	Last Historical A_{B_X}			bp
and	Second Last Historical A_{B_X}			bq
12217	Third Last Historical A_{B_X}			br
14203	Last Historical $\Delta SF(A)_Y$			bs
and	Second Last Historical $\Delta SF(A)_Y$			bt
12217	Third Last Historical $\Delta SF(A)_Y$			bu
14203	Last Historical A_{B_Y}			bv
and	Second Last Historical A_{B_Y}			bw
12217	Third Last Historical A_{B_Y}			bx
14205	Last Historical $\Delta SF(A)_Z$			by
and	Second Last Historical $\Delta SF(A)_Z$			bz
12217	Third Last Historical $\Delta SF(A)_Z$			ca
14205	Last Historical A_{B_Z}			cb
and	Second Last Historical A_{B_Z}			cc
12217	Third Last Historical A_{B_Z}			cd

Table 5 (cont)

DATE 30 JUN 66

JOB IMU PERFORMANCE TEST

JDC 12217 REV. K PAGE 1 OF 8

INITIAL TDRR 29882 D.S. PGS 42

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The three IRIG coefficient terms, BD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-
E	11-3-66	31779	4-6	2-6	EA	-
F	11-15-66	31938	-	1	EA	-
G	11-17-66	31932	3	-	EA	-
H	1-5-67	32494	1,2,5,6	1	EA	-
J	3-23-67	33377	All	All	EA	-
K	6-6-67	33909	2,4,5,6,7	2-4,19-21, 26-28	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5. Record most recent historical values (up to three values) and test dates for coefficient terms BD, ADSRA, ADIA, Δ SF (A) and A_B from ISS testing and from any prior runs of this JDC.

2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not initialize a test position if less than 90 minutes remain before time of overflow.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the SCOPE by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Current Source Monitor panel to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Set the PIP and IRIG S.F. MONITOR switch to OFF and perform the following DSKY operations:

VERB 57 ENTR
00001 ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3). If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+18000 ENTR
To correct ROW 2 -
VERB 22 ENTR
Test site latitude from Table 3 ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00001 ENTR

+BDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00002 ENTR

+BDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

22A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00407 ENTR
c. 77757 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00411 ENTR
f. 00020 ENTR

-BDX + ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

23A. Perform the following DSKY operations:

a. VERB 06 NOUN 03 ENTR
b. 02530 ENTR
c. Record ROW 1 indication.
d. ENTR
e. 02531 ENTR
f. Record ROW 1 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR

To correct ROW 3 -
VERB 23 ENTR
+00003 ENTR

-BDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S.F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00004 ENTR

+BDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Z PIPA S.F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

31A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00405 ENTR
c. 00020 ENTR
d. VERB 21 NOUN 21 ENTR
e. 00407 ENTR
f. 77757 ENTR

+BDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

32A. Perform the following DSKY operations:

a. VERB 06 NOUN 03 ENTR
b. 02530 ENTR
c. Record ROW 1 indication.
d. ENTR
e. 02531 ENTR
f. Record ROW 1 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

+BDZ - ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+BDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-BDY + ADIAY

41. Calculate -BDZ - ADSRAZ as shown on data sheet.

41A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00405 ENTR
c. 77757 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00411 ENTR
f. 00020 ENTR

-Y PIPA S.F. TEST

42. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

NOTE: Read and understand step 43 before proceeding.

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 02637 ENTR
d. Enter the calculated value of -BDZ -ADSRAZ into the DSKY as ±XXX.XX and press the ENTR pushbutton.
e. VERB 06 NOUN 20 ENTR
f. Record exact time of pressing ENTR in e above.
g. Record ROW 1, ROW 2, and ROW 3 indications.
h. One hour after pressing ENTR in e above, press ENTR again.
i. Record exact time of pressing ENTR in h above.
j. Record ROW 1, ROW 2, and ROW 3 indications.
k. If KEY REL indicator on DSKY flashes press KEY REL pushbutton.
l. Observe
VERB 06 NOUN 66 Flashing
m. Record ROW 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Calculate coefficient terms BD, ADSRA, ADIA, ∆SF(A), and A_B. Record results.

48. Calculate coefficient stability terms D_1, D_2, and D_3 for each coefficient and record results as the initial values. (A total of four coefficient values are required in order to calculate a D_3 term.) If all stability term values are within the maximums given, record the results as the final values and proceed to the next step. If any

---

stability term value exceeds the maximum given, retest the IMU by performing the retest sequence given in steps 50 through 55.

49. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

RETEST SEQUENCE

NOTE: The following steps are to be performed only if the stability values calculated in step 48 exceed maximum values on the initial run.

50. Repeat steps 1 through 47. Record results on data sheet spaces provided.

51. Perform JDC 12204 to downmode system to ISS Standby.

52. Perform JDC 12204 to advance system to ISS Operate.

53. Repeat steps 1 through 47.

54. Calculate coefficient stability terms D_1, D_2 and D_3 for each coefficient and record results as the final values.

55. Return to step 49.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 42

JOB IMU PERFORMANCE TEST

JDC NO. 12217
REV. K
INITIAL TDRR 29882

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time					
2.a	X PIPA G/S output	Volts p-p			15		
2.b	Y PIPA G/S output	Volts p-p			15		
2.c	Z PIPA G/S output	Volts p-p			15		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts dc	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 42

JOB IMU PERFORMANCE TEST

JDC NO. 12217
REV K

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+BDY (ROW 2 indication) Position +00001	meru		( )___.___				a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²		( )______. ( )_____				b
21	+BDZ (ROW 2 indication) Position +00002	meru		( )___.___				c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²		( )______. ( )_____				d
23	-BDX + ADIAX (ROW 2 indication) Position +00002	meru		( )___.___				e
23A.c	ROW 1 indication	deg		___.__				
23A.f	ROW 1 indication	deg		___.__				
26	-BDX (ROW 2 indication) Position +00003	meru		( )___.___				f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²		( )______. ( )_____				g

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 42

JOB IMU PERFORMANCE TEST

JDC NO. 12217
REV. K

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru		( )___.___				h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec²		( )______. ( )_____				i
32	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru		( )___.___				j
32A.c	ROW 1 indication	deg		__.___				
32A.f	ROW 1 indication	deg		__.___				
36	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru		( )___.___				k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec²		( )______. ( )_____				m
40	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru		( )___.__				n
41	-BDZ - ADSRAZ = (line k) -2 (line c)	meru		( )___.___				p

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	-Y PIPA Test (ROW 1 indication) Position +00006 (ROW 2 indication)	cm/sec²		( )______. ( )_____				q
43.f	Time of ENTR	Time		__hrs__min__sec				
43.g	ROW 1 indication	deg		( )___.__				
	ROW 2 indication	deg		( )___.__				
	ROW 3 indication	deg		( )___.__				
43.i	Time of ENTR	Time		__hrs__min__sec				
43.j	ROW 1 indication	deg		( )___.__				
	ROW 2 indication	deg		( )___.__				
	ROW 3 indication	deg		( )___.__				
43.m	-BDY + ADIAY (ROW 2 indication) Position +00006	meru		( )___.__				r

JDC ITEM NO.	CALCULATIONS
47.a	BD_X = - (line f) = ( ) meru
47.b	BD_Y = line a = ( ) meru

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JDC ITEM NO.	CALCULATIONS	
47.c	BD_Z = line c = ( )	meru
47.d	$ADSRA_X$ = line n + line f = ( )	meru/g
47.e	$ADSRA_Y$ = line h - line a = ( )	meru/g
47.f	$ADSRA_Z$ = - (line k) + line c = ( )	meru/g
47.g	$ADIA_X$ = -1 [-(line e) + (line f)] = ( )	meru/g
47.h	$ADIA_Y$ = line r + line a = ( )	meru/g
47.i	$ADIA_Z$ = line j - line c = ( )	meru/g
47.j	g = ___.__ , (Enter local gravity from Table 4)	cm/sec²
	$SF(A)_X = \frac{2g \times 5.850000}{\text{line b - line d}}$	cm/sec/pulse
	$\Delta SF(A)_X = \frac{[SF(A)_X - 5.85] \times 10^6}{5.85}$	ppm

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JDC ITEM NO.	CALCULATIONS	
47.k	$SF(A)_Y = \frac{2g \times 5.850000}{\text{line m - line q}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \frac{[SF(A)_Y - 5.85] \times 10^6}{5.85}$	ppm
47.l	$SF(A)_Z = \frac{2g \times 5.850000}{\text{line g - line i}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \frac{[SF(A)_Z - 5.85] \times 10^6}{5.85}$	ppm
47.m	$A_{B_X} = \frac{\text{line b + line d}}{2}$	cm/sec²
47.n	$A_{B_Y} = \frac{\text{line m + line q}}{2}$	cm/sec²
47.o	$A_{B_Z} = \frac{\text{line i + line g}}{2}$	cm/sec²

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47.a	B_{D_X}	meru	-15.0		+15.0			s
47.b	B_{D_Y}	meru	-15.0		+15.0			t
47.c	B_{D_Z}	meru	-15.0		+15.0			u
47.d	$ADSRA_X$	meru/g	-40.0		+40.0			v
47.e	$ADSRA_Y$	meru/g	-40.0		+40.0			w
47.f	$ADSRA_Z$	meru/g	-40.0		+40.0			x
47.g	$ADIA_X$	meru/g	-100		+100			y
47.h	$ADIA_Y$	meru/g	-100		+100			z
47.i	$ADIA_Z$	meru/g	-100		+100			aa
47.j	$\Delta SF(A)_X$	ppm	-1900		+1900			ab
47.k	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac
47.l	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad
47.m	A_{B_X}	cm/sec²	-2.20		+2.20			ae
47.n	A_{B_Y}	cm/sec²	-2.20		+2.20			af
47.o	A_{B_Z}	cm/sec²	-2.20		+2.20			ag

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JDC ITEM NO.	CALCULATIONS	
48.a	BD_XD_1 = |line ah - line s|	meru
	$BD_XD_2 = D_1$ + |line ai - line ah|	meru
	$BD_XD_3 = D_2$ + |line aj - line ai|	meru
48.b	BD_YD_1 = |line as - line t|	meru
	$BD_YD_2 = D_1$ + |line at - line as|	meru
	$BD_YD_3 = D_2$ + |line au - line at|	meru
48.c	BD_ZD_1 = |line bb - line u|	meru
	$BD_ZD_2 = D_1$ + |line bc - line bb|	meru
	$BD_ZD_3 = D_2$ + |line bd - line bc|	meru

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REV. K

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
48.d	$ADSRA_XD_1 = \lvert \text{line ak - line v} \rvert$	meru/g
	$ADSRA_XD_2 = D_1 + \lvert \text{line am - line ak} \rvert$	meru/g
	$ADSRA_XD_3 = D_2 + \lvert \text{line an - line am} \rvert$	meru/g
48.e	$ADSRA_YD_1 = \lvert \text{line av - line w} \rvert$	meru/g
	$ADSRA_YD_2 = D_1 + \lvert \text{line aw - line av} \rvert$	meru/g
	$ADSRA_YD_3 = D_2 + \lvert \text{line ax - line aw} \rvert$	meru/g
48.f	$ADSRA_ZD_1 = \lvert \text{line be - line x} \rvert$	meru/g
	$ADSRA_ZD_2 = D_1 + \lvert \text{line bf - line be} \rvert$	meru/g
	$ADSRA_ZD_3 = D_2 + \lvert \text{line bg - line bf} \rvert$	meru/g

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
48.g	$ADIA_XD_1 = \lvert \text{line ap - line y} \rvert$	meru/g
	$ADIA_XD_2 = D_1 + \lvert \text{line aq - line ap} \rvert$	meru/g
	$ADIA_XD_3 = D_2 + \lvert \text{line ar - line aq} \rvert$	meru/g
48.h	$ADIA_YD_1 = \lvert \text{line ay - line z} \rvert$	meru/g
	$ADIA_YD_2 = D_1 + \lvert \text{line az - line ay} \rvert$	meru/g
	$ADIA_YD_3 = D_2 + \lvert \text{line ba - line az} \rvert$	meru/g
48.i	$ADIA_ZD_1 = \lvert \text{line bh - line aa} \rvert$	meru/g
	$ADIA_ZD_2 = D_1 + \lvert \text{line bi - line bh} \rvert$	meru/g
	$ADIA_ZD_3 = D_2 + \lvert \text{line bj - line bi} \rvert$	meru/g

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JDC ITEM NO.	CALCULATIONS	
48.j	$\Delta\ SF(A)_XD_1 = \lvert \text{line bk - line ab} \rvert$	ppm
	$\Delta\ SF(A)_XD_2 = D_1 + \lvert \text{line bm - line bk} \rvert$	ppm
	$\Delta\ SF(A)_XD_3 = D_2 + \lvert \text{line bn - line bm} \rvert$	ppm
48.k	$\Delta\ SF(A)_YD_1 = \lvert \text{line bs - line ac} \rvert$	ppm
	$\Delta\ SF(A)_YD_2 = D_1 + \lvert \text{line bt - line bs} \rvert$	ppm
	$\Delta\ SF(A)_YD_3 = D_2 + \lvert \text{line bu - line bt} \rvert$	ppm
48.l	$\Delta\ SF(A)_ZD_1 = \lvert \text{line by - line ad} \rvert$	ppm
	$\Delta\ SF(A)_ZD_2 = D_1 + \lvert \text{line bz - line by} \rvert$	ppm
	$\Delta\ SF(A)_ZD_3 = D_2 + \lvert \text{line ca - line bz} \rvert$	ppm

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JDC ITEM NO.	CALCULATIONS	
48.m	$A_{B_X}\ D_1 = \lvert \text{line bp - line ae} \rvert$	cm/sec^2
	$A_{B_X}\ D_2 = D_1 + \lvert \text{line bq - line bp} \rvert$	cm/sec^2
	$A_{B_X}\ D_3 = D_2 + \lvert \text{line br - line bq} \rvert$	cm/sec^2
48.n	$A_{B_Y}\ D_1 = \lvert \text{line bv - line af} \rvert$	cm/sec^2
	$A_{B_Y}\ D_2 = D_1 + \lvert \text{line bw - line bv} \rvert$	cm/sec^2
	$A_{B_Y}\ D_3 = D_2 + \lvert \text{line bx - line bw} \rvert$	cm/sec^2
48.o	$A_{B_Z}\ D_1 = \lvert \text{line cb - line ag} \rvert$	cm/sec^2
	$A_{B_Z}\ D_2 = D_1 + \lvert \text{line cc - line cb} \rvert$	cm/sec^2
	$A_{B_Z}\ D_3 = D_2 + \lvert \text{line cd - line cc} \rvert$	cm/sec^2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.a	Initial BD_XD_1	meru	▨		6.0	▨	▨
	Initial BD_XD_2	meru	▨		9.0	▨	▨
	Initial BD_XD_3	meru	▨		11.0	▨	▨
48.a	Final BD_XD_1	meru	▨		6.0		
or	Final BD_XD_2	meru	▨		9.0		
54.a	Final BD_XD_3	meru	▨		11.0		
48.b	Initial BD_YD_1	meru	▨		6.0	▨	▨
	Initial BD_YD_2	meru	▨		9.0	▨	▨
	Initial BD_YD_3	meru	▨		11.0	▨	▨
48.b	Final BD_YD_1	meru	▨		6.0		
or	Final BD_YD_2	meru	▨		9.0		
54.b	Final BD_YD_3	meru	▨		11.0		
48.c	Initial BD_ZD_1	meru	▨		6.0	▨	▨
	Initial BD_ZD_2	meru	▨		9.0	▨	▨
	Initial BD_ZD_3	meru	▨		11.0	▨	▨
48.c	Final BD_ZD_1	meru	▨		6.0		
or	Final BD_ZD_2	meru	▨		9.0		
54.c	Final BD_ZD_3	meru	▨		11.0		

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.d	Initial $ADSRA_XD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_XD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_XD_3$	meru/g	▨		25.0	▨	▨
48.d	Final $ADSRA_XD_1$	meru/g	▨		14.0		
or	Final $ADSRA_XD_2$	meru/g	▨		21.0		
54.d	Final $ADSRA_XD_3$	meru/g	▨		25.0		
48.e	Initial $ADSRA_YD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_YD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_YD_3$	meru/g	▨		25.0	▨	▨
48.e	Final $ADSRA_YD_1$	meru/g	▨		14.0		
or	Final $ADSRA_YD_2$	meru/g	▨		21.0		
54.e	Final $ADSRA_YD_3$	meru/g	▨		25.0		
48.f	Initial $ADSRA_ZD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_ZD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_ZD_3$	meru/g	▨		25.0	▨	▨
48.f	Final $ADSRA_ZD_1$	meru/g	▨		14.0		
or	Final $ADSRA_ZD_2$	meru/g	▨		21.0		
54.f	Final $ADSRA_ZD_3$	meru/g	▨		25.0		

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.g	Initial $ADIA_XD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_XD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_XD_3$	meru/g	▨		40.0	▨	▨
48.g	Final $ADIA_XD_1$	meru/g	▨		17.0		
or	Final $ADIA_XD_2$	meru/g	▨		33.0		
54.g	Final $ADIA_XD_3$	meru/g	▨		40.0		
48.h	Initial $ADIA_YD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_YD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_YD_3$	meru/g	▨		40.0	▨	▨
48.h	Final $ADIA_YD_1$	meru/g	▨		17.0		
or	Final $ADIA_YD_2$	meru/g	▨		33.0		
54.h	Final $ADIA_YD_3$	meru/g	▨		40.0		
48.i	Initial $ADIA_ZD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_ZD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_ZD_3$	meru/g	▨		40.0	▨	▨
48.i	Final $ADIA_ZD_1$	meru/g	▨		17.0		
or	Final $ADIA_ZD_2$	meru/g	▨		33.0		
54.i	Final $ADIA_ZD_3$	meru/g	▨		40.0		

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JDC
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.j	Initial $\Delta SF(A)_XD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_XD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_XD_3$	ppm	▨		600	▨	▨
48.j	Final $\Delta SF(A)_XD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_XD_2$	ppm	▨		500		
54.j	Final $\Delta SF(A)_XD_3$	ppm	▨		600		
48.k	Initial $\Delta SF(A)_YD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_YD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_YD_3$	ppm	▨		600	▨	▨
48.k	Final $\Delta SF(A)_YD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_YD_2$	ppm	▨		500		
54.k	Final $\Delta SF(A)_YD_3$	ppm	▨		600		
48.l	Initial $\Delta SF(A)_ZD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_ZD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_ZD_3$	ppm	▨		600	▨	▨
48.l	Final $\Delta SF(A)_ZD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_ZD_2$	ppm	▨		500		
54.l	Final $\Delta SF(A)_ZD_3$	ppm	▨		600		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.m	Initial $A_{B_X}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_X}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_X}D_3$	cm/sec^2	▨		0.90	▨	▨
48.m	Final $A_{B_X}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_X}D_2$	cm/sec^2	▨		0.70		
54.m	Final $A_{B_X}D_3$	cm/sec^2	▨		0.90		
48.n	Initial $A_{B_Y}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_Y}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_Y}D_3$	cm/sec^2	▨		0.90	▨	▨
48.n	Final $A_{B_Y}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_Y}D_2$	cm/sec^2	▨		0.70		
54.n	Final $A_{B_Y}D_3$	cm/sec^2	▨		0.90		
48.o	Initial $A_{B_Z}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_Z}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_Z}D_3$	cm/sec^2	▨		0.90	▨	▨

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JDC
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REV. K

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.o	Final $A_{B_Z}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_Z}D_2$	cm/sec^2	▨		0.70		
54.o	Final $A_{B_Z}D_3$	cm/sec^2	▨		0.90		
50 (1)	Gyro WHEEL	Time	▨		▨	▨	▨
50 (2.a)	X PIPA G/S output	Volts p-p	▨		15		
50 (2.b)	Y PIPA G/S output	Volts p-p	▨		15		
50 (2.c)	Z PIPA G/S output	Volts p-p	▨		15		
50 (6.f.1)	X PIPA PVR	Volts dc	5.94		6.06		
50 (6.f.2)	Y PIPA PVR	Volts dc	5.94		6.06		
50 (6.f.3)	Z PIPA PVR	Volts dc	5.94		6.06		
50 (11)	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (17)	+BDY (ROW 2 indication) Position +00001	meru	▨	( ) ___.__	▨	▨	▨	a.1
50 (18)	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	b.1
50 (21)	+BDZ (ROW 2 indication) Position +00002	meru	▨	( ) ___.__	▨	▨	▨	c.1
50 (22)	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	d.1
50 (23)	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( ) ___.__	▨	▨	▨	e.1
50 (23A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (23A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (26)	-BDX (ROW 2 indication) Position +00003	meru	▨	( ) ___.__	▨	▨	▨	f.1
50 (27)	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	g.1

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REV. K

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (30)	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( ) ___.__	▨	▨	▨	h.1
50 (31)	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	i.1
50 (32)	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( ) ___.__	▨	▨	▨	j.1
50 (32A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (32A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (36)	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( ) ___.__	▨	▨	▨	k.1
50 (37)	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	m.1
50 (40)	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( ) ___.__	▨	▨	▨	n.1
50 (41)	-BDZ - ADSRAZ = (line k.1) -2 (line c.1) =	meru	▨	( ) ___.__	▨	▨	▨	p.1

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EQUIPMENT TEST
DATA SHEET 21 **OF** 42

JDC
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (42)	-Y PIPA Test (ROW 1 indication) Position + 00006 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____.	▨	▨	▨	q. 1
50 (43. f)	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
50 (43. g)	ROW 1 indication	deg	▨	( ) ___. __	▨	▨	▨	
	ROW 2 indication	deg	▨	( ) ___. __	▨	▨	▨	
	ROW 3 indication	deg	▨	( ) ___. __	▨	▨	▨	
50 (43. i)	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
50 (43. j)	ROW 1 indication	deg	▨	( ) ___. __	▨	▨	▨	
	ROW 2 indication	deg	▨	( ) ___. __	▨	▨	▨	
	ROW 3 indication	deg	▨	( ) ___. __	▨	▨	▨	
50 (43. m)	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( ) ___. __	▨	▨	▨	r. 1

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JDC
NO. 12217
REV. K

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
50 (47. a)	$BD_X = -$ (line f. 1) = ( )	meru
50 (47. b)	$BD_Y =$ line a. 1 = ( )	meru
50 (47. c)	$BD_Z =$ line c. 1 = ( )	meru
50 (47. d)	$ADSRA_X =$ line n. 1 + line f. 1 = ( )	meru/g
50 (47. e)	$ADSRA_Y =$ line h. 1 - line a. 1 = ( )	meru/g

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JDC
NO. 12217
REV. K

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
50 (47. f)	$ADSRA_Z = -$ (line k. 1) + line c. 1 = ( )	meru/g
50 (47. g)	$ADIA_X = -1 \left[(\text{line e. 1}) + (\text{line f. 1}) \right] = (\ )$	meru/g
50 (47. h)	$ADIA_Y =$ line r. 1 + line a. 1 = ( )	meru/g
50 (47. i)	$ADIA_Z =$ line j. 1 - line c. 1 = ( )	meru/g
50 (47. j)	g = ___. __ (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \dfrac{2g \times 5.850000}{\text{line b. 1 - line d. 1}}$	cm/sec/pulse
	$\Delta SF(A)_X = \dfrac{\left[SF(A)_X - 5.85\right] \times 10^6}{5.85}$	ppm

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JDC
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REV. K

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
50 (47. k)	$SF(A)_Y = \dfrac{2g \times 5.850000}{\text{line m. 1 - line q. 1}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \dfrac{\left[SF(A)_Y - 5.85\right] \times 10^6}{5.85}$	ppm
50 (47. l)	$SF(A)_Z = \dfrac{2g \times 5.850000}{\text{line g. 1 - line i. 1}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \dfrac{\left[SF(A)_Z - 5.85\right] \times 10^6}{5.85}$	ppm
50 (47. m)	$A_{B_X} = \dfrac{\text{line b. 1 + line d. 1}}{2}$	cm/sec^2
50 (47. n)	$A_{B_Y} = \dfrac{\text{line m. 1 + line q. 1}}{2}$	cm/sec^2
50 (47. o)	$A_{B_Z} = \dfrac{\text{line i. 1 + line g. 1}}{2}$	cm/sec^2

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EQUIPMENT TEST
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JDC
NO. 12217
REV. K

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (47.a)	B_{D_X}	meru	-15.0		+15.0			s.1
50 (47.b)	B_{D_Y}	meru	-15.0		+15.0			t.1
50 (47.c)	B_{D_Z}	meru	-15.0		+15.0			u.1
50 (47.d)	$ADSRA_X$	meru/g	-40.0		+40.0			v.1
50 (47.e)	$ADSRA_Y$	meru/g	-40.0		+40.0			w.1
50 (47.f)	$ADSRA_Z$	meru/g	-40.0		+40.0			x.1
50 (47.g)	$ADIA_X$	meru/g	-100		+100			y.1
50 (47.h)	$ADIA_Y$	meru	-100		+100			z.1
50 (47.i)	$ADIA_Z$	meru/g	-100		+100			aa.1
50 (47.j)	$\Delta SF(A)_X$	ppm	-1900		+1900			ab.1
50 (47.k)	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac.1
50 (47.l)	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad.1

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EQUIPMENT TEST
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JDC
NO. 12217
REV. K

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (47.m)	A_{B_X}	cm/sec^2	-2.20		+2.20			ae.1
50 (47.n)	A_{B_Y}	cm/sec^2	-2.20		+2.20			af.1
50 (47.o)	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag.1
53 (1)	Gyro WHEEL	Time						
53 (2.a)	X PIPA G/S output	Volts p-p			15			
53 (2.b)	Y PIPA G/S output	Volts p-p			15			
53 (2.c)	Z PIPA G/S output	Volts p-p			15			
53 (6.f.1)	X PIPA PVR	Volts dc	5.94		6.06			
53 (6.f.2)	Y PIPA PVR	Volts dc	5.94		6.06			
53 (6.f.3)	Z PIPA PVR	Volts dc	5.94		6.06			
53 (11)	X PIPA TCM	Volts dc	0.98		1.08			
	Y PIPA TCM	Volts dc	0.98		1.08			

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JDC
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (11) (cont)	Z PIPA TCM	Volts dc	0.98		1.08			
53 (17)	+BDY (ROW 2 indication) Position +00001	meru		( )___.__				a.2
53 (18)	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2		( )_____. ( )_____				b.2
53 (21)	+BDZ (ROW 2 indication) Position +00002	meru		( )___.__				c.2
53 (22)	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2		( )_____. ( )_____				d.2
53 (23)	-BDX + ADIAX (ROW 2 indication) Position +00002	meru		( )___.__				e.2
53 (23A.c)	ROW 1 indication	deg		___.__				
53 (23A.f)	ROW 1 indication	deg		___.__				
53 (26)	-BDX (ROW 2 indication) Position +00003	meru		( )___.__				f.2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (27)	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2		( )_____. ( )_____				g.2
53 (30)	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru		( )___.__				h.2
53 (31)	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2		( )_____. ( )_____				i.2
53 (32)	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru		( )___.__				j.2
53 (32A.c)	ROW 1 indication	deg		___.__				
53 (32A.f)	ROW 1 indication	deg		___.__				
53 (36)	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru		( )___.__				k.2
53 (37)	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2		( )_____. ( )_____				m.2
53 (40)	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru		( )___.__				n.2

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JDC
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (41)	-BDZ - ADSRAZ = (line k.2) -2 (line c.2) =	meru	▨	( ) ___.__	▨	▨	▨	p.2
53 (42)	-Y PIPA Test (ROW 1 indication) Position +00006 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	q.2
53 (43.f)	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
53 (43.g)	ROW 1 indication	deg	▨	( ) ___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( ) ___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( ) ___.__	▨	▨	▨	
53 (43.i)	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
53 (43.j)	ROW 1 indication	deg	▨	( ) ___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( ) ___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( ) ___.__	▨	▨	▨	
53 (43.m)	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( ) ___.__	▨	▨	▨	r.2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
53 (47.a)	$BD_X = -(\text{line f.2}) = (\ \ )$	meru
53 (47.b)	$BD_Y = \text{line a.2} = (\ \ )$	meru
53 (47.c)	$BD_Z = \text{line c.2} = (\ \ )$	meru
53 (47.d)	$ADSRA_X = \text{line n.2} + \text{line f.2} = (\ \ )$	meru/g

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
53 (47.e)	$ADSRA_Y = \text{line h.2} - \text{line a.2} = (\ \ )$	meru/g
53 (47.f)	$ADSRA_Z = -(\text{line k.2}) + \text{line c.2} = (\ \ )$	meru/g
53 (47.g)	$ADIA_X = -1\left[-(\text{line e.2}) + (\text{line f.2})\right] = (\ \ )$	meru/g
53 (47.h)	$ADIA_Y = \text{line r.2} + \text{line a.2} = (\ \ )$	meru/g
53 (47.i)	$ADIA_Z = \text{line j.2} - \text{line c.2} = (\ \ )$	meru/g
53 (47.j)	g = ___.__ (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \dfrac{2g \times 5.850000}{\text{line b.2} - \text{line d.2}}$	cm/sec/pulse
	$\Delta SF(A)_X = \dfrac{\left[SF(A)_X - 5.85\right] \times 10^6}{5.85}$	ppm

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
53 (47.k)	$SF(A)_Y = \dfrac{2g \times 5.850000}{\text{line m.2} - \text{line q.2}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \dfrac{\left[SF(A)_Y - 5.85\right] \times 10^6}{5.85}$	ppm
53 (47.l)	$SF(A)_Z = \dfrac{2g \times 5.850000}{\text{line g.2} - \text{line i.2}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \dfrac{\left[SF(A)_Z - 5.85\right] \times 10^6}{5.85}$	ppm
53 (47.m)	$A_{B_X} = \dfrac{\text{line b.2} + \text{line d.2}}{2}$	cm/sec^2
53 (47.n)	$A_{B_Y} = \dfrac{\text{line m.2} + \text{line q.2}}{2}$	cm/sec^2
53 (47.o)	$A_{B_Z} = \dfrac{\text{line i.2} + \text{line g.2}}{2}$	cm/sec^2

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JDC
NO. 122 7
REV. K

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (47.a)	B_{D_X}	meru	-15.0		+15.0			s.2
53 (47.b)	B_{D_Y}	meru	-15.0		+15.0			t.2
53 (47.c)	B_{D_Z}	meru	-15.0		+15.0			u.2
53 (47.d)	$ADSRA_X$	meru/g	-40.0		+40.0			v.2
53 (47.e)	$ADSRA_Y$	meru/g	-40.0		+40.0			w.2
53 (47.f)	$ADSRA_Z$	meru/g	-40.0		+40.0			x.2
53 (47.g)	$ADIA_X$	meru/g	-100		+100			y.2
53 (47.h)	$ADIA_Y$	meru/g	-100		+100			z.2
53 (47.i)	$ADIA_Z$	meru/g	-100		+100			aa.2
53 (47.j)	$\Delta SF(A)_X$	ppm	-1900		+1900			ab.2
53 (47.k)	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac.2
53 (47.l)	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad.2

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JDC
NO. 12217
REV. K

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (47.m)	A_{B_X}	cm/sec^2	-2.20		+2.20			ae.2
53 (47.n)	A_{B_Y}	cm/sec^2	-2.20		+2.20			af.2
53 (47.o)	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag.2

JDC ITEM NO.	CALCULATIONS	
54.a	$BD_XD_1 = \lvert \text{line s.1} - \text{line s.2} \rvert$	meru
	$BD_XD_2 = D_1 + \lvert \text{line s} - \text{line s.1} \rvert$	meru
	$BD_XD_3 = D_2 + \lvert \text{line ah} - \text{line s} \rvert$	meru
54.b	$BD_YD_1 = \lvert \text{line t.1} - \text{line t.2} \rvert$	meru
	$BD_YD_2 = D_1 + \lvert \text{line t} - \text{line t.1} \rvert$	meru
	$BD_YD_3 = D_2 + \lvert \text{line as} - \text{line t} \rvert$	meru

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
54.c	$BD_ZD_1 = \lvert \text{line u.1} - \text{line u.2} \rvert$	meru
	$BD_ZD_2 = D_1 + \lvert \text{line u} - \text{line u.1} \rvert$	meru
	$BD_ZD_3 = D_2 + \lvert \text{line bb} - \text{line u} \rvert$	meru
54.d	$ADSRA_XD_1 = \lvert \text{line v.1} - \text{line v.2} \rvert$	meru/g
	$ADSRA_XD_2 = D_1 + \lvert \text{line v} - \text{line v.1} \rvert$	meru/g
	$ADSRA_XD_3 = D_2 + \lvert \text{line ak} - \text{line v} \rvert$	meru/g
54.e	$ADSRA_YD_1 = \lvert \text{line w.1} - \text{line w.2} \rvert$	meru/g
	$ADSRA_YD_2 = D_1 + \lvert \text{line w} - \text{line w.1} \rvert$	meru/g
	$ADSRA_YD_3 = D_2 + \lvert \text{line av} - \text{line w} \rvert$	meru/g

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
54.f	$ADSRA_ZD_1 = \lvert \text{line x.1} - \text{line x.2} \rvert$	meru/g
	$ADSRA_ZD_2 = D_1 + \lvert \text{line x} - \text{line x.1} \rvert$	meru/g
	$ADSRA_ZD_3 = D_2 + \lvert \text{line be} - \text{line x} \rvert$	meru/g
54.g	$ADIA_XD_1 = \lvert \text{line y.1} - \text{line y.2} \rvert$	meru/g
	$ADIA_XD_2 = D_1 + \lvert \text{line y} - \text{line y.1} \rvert$	meru/g
	$ADIA_XD_3 = D_2 + \lvert \text{line ap} - \text{line y} \rvert$	meru/g
54.h	$ADIA_YD_1 = \lvert \text{line z.1} - \text{line z.2} \rvert$	meru/g
	$ADIA_YD_2 = D_1 + \lvert \text{line z} - \text{line z.1} \rvert$	meru/g
	$ADIA_YD_3 = D_2 + \lvert \text{line ay} - \text{line z} \rvert$	meru/g

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
54.i	$ADIA_Z D_1 = \lvert \text{line aa.1} - \text{line aa.2} \rvert$	meru/g
	$ADIA_Z D_2 = D_1 + \lvert \text{line aa} - \text{line aa.1} \rvert$	meru/g
	$ADIA_Z D_3 = D_2 + \lvert \text{line bh} - \text{line aa} \rvert$	meru/g
54.j	$\Delta SF(A)_X D_1 = \lvert \text{line ab.1} - \text{line ab.2} \rvert$	ppm
	$\Delta SF(A)_X D_2 = D_1 + \lvert \text{line ab} - \text{line ab.1} \rvert$	ppm
	$\Delta SF(A)_X D_3 = D_2 + \lvert \text{line bk} - \text{line ab} \rvert$	ppm
54.k	$\Delta SF(A)_Y D_1 = \lvert \text{line ac.1} - \text{line ac.2} \rvert$	ppm
	$\Delta SF(A)_Y D_2 = D_1 + \lvert \text{line ac} - \text{line ac.1} \rvert$	ppm
	$\Delta SF(A)_Y D_3 = D_2 + \lvert \text{line bs} - \text{line ac} \rvert$	ppm

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JDC ITEM NO.	CALCULATIONS	
54.l	$\Delta SF(A)_Z D_1 = \lvert \text{line ad.1} - \text{line ad.2} \rvert$	ppm
	$\Delta SF(A)_Z D_2 = D_1 + \lvert \text{line ad} - \text{line ad.1} \rvert$	ppm
	$\Delta SF(A)_Z D_3 = D_2 + \lvert \text{line by} - \text{line ad} \rvert$	ppm
54.m	$A_{B_X} D_1 = \lvert \text{line ae.1} - \text{line ae.2} \rvert$	cm/sec^2
	$A_{B_X} D_2 = D_1 + \lvert \text{line ae} - \text{line ae.1} \rvert$	cm/sec^2
	$A_{B_X} D_3 = D_2 + \lvert \text{line bp} - \text{line ae} \rvert$	cm/sec^2
54.n	$A_{B_Y} D_1 = \lvert \text{line af.1} - \text{line af.2} \rvert$	cm/sec^2
	$A_{B_Y} D_2 = D_1 + \lvert \text{line af} - \text{line af.1} \rvert$	cm/sec^2
	$A_{B_Y} D_3 = D_2 + \lvert \text{line bv} - \text{line af} \rvert$	cm/sec^2

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JDC ITEM NO.	CALCULATIONS	
54.o	$A_{B_Z} D_1 = \lvert \text{line ag.1} - \text{line ag.2} \rvert$	cm/sec^2
	$A_{B_Z} D_2 = D_1 + \lvert \text{line ag} - \text{line ag.1} \rvert$	cm/sec^2
	$A_{B_Z} D_3 = D_2 + \lvert \text{line cb} - \text{line ag} \rvert$	cm/sec^2

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4.

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JOB IMU PERFORMANCE TEST

JDC		VALUE	TEST DATE	
16236	(EXAMPLE) Last Historical BD_X	+1.46	3/8/67	
and				
12217	(EXAMPLE) Second Last Historical BD_X	+1.09	2/15/67	
	(EXAMPLE) Third Last Historical BD_X	-0.29	1/24/67	
16236	Last Historical BD_X			ah
and	Second Last Historical BD_X			ai
12217	Third Last Historical BD_X			aj
16236	Last Historical $ADSRA_X$			ak
and	Second Last Historical $ADSRA_X$			am
12217	Third Last Historical $ADSRA_X$			an
16237	Last Historical $ADIA_X$			ap
and	Second Last Historical $ADIA_X$			aq
12217	Third Last Historical $ADIA_X$			ar
16239	Last Historical BD_Y			as
and	Second Last Historical BD_Y			at
12217	Third Last Historical BD_Y			au

Table 5

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JDC
NO. 12217
REV. K

JOB IMU PERFORMANCE TEST

JDC		VALUE	TEST DATE	
16239	Last Historical ADSRA$_Y$			av
and	Second Last Historical ADSRA$_Y$			aw
12217	Third Last Historical ADSRA$_Y$			ax
16240	Last Historical ADIA$_Y$			ay
and	Second Last Historical ADIA$_Y$			az
12217	Third Last Historical ADIA$_Y$			ba
16242	Last Historical BD$_Z$			bb
and	Second Last Historical BD$_Z$			bc
12217	Third Last Historical BD$_Z$			bd
16242	Last Historical ADSRA$_Z$			be
and	Second Last Historical ADSRA$_Z$			bf
12217	Third Last Historical ADSRA$_Z$			bg
16243	Last Historical ADIA$_Z$			bh
and	Second Last Historical ADIA$_Z$			bi
12217	Third Last Historical ADIA$_Z$			bj
14201	Last Historical $\Delta SF(A)_X$			bk
and	Second Last Historical $\Delta SF(A)_X$			bm
12217	Third Last Historical $\Delta SF(A)_X$			bn

Table 5 (cont)

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 42 **OF** 42

JDC
NO. 12217
REV. K

JOB IMU PERFORMANCE TEST

JDC		VALUE	TEST DATE	
14201	Last Historical A_{B_X}			bp
and	Second Last Historical A_{B_X}			bq
12217	Third Last Historical A_{B_X}			br
14203	Last Historical $\Delta SF(A)_Y$			bs
and	Second Last Historical $\Delta SF(A)_Y$			bt
12217	Third Last Historical $\Delta SF(A)_Y$			bu
14203	Last Historical A_{B_Y}			bv
and	Second Last Historical A_{B_Y}			bw
12217	Third Last Historical A_{B_Y}			bx
14205	Last Historical $\Delta SF(A)_Z$			by
and	Second Last Historical $\Delta SF(A)_Z$			bz
12217	Third Last Historical $\Delta SF(A)_Z$			ca
14205	Last Historical A_{B_Z}			cb
and	Second Last Historical A_{B_Z}			cc
12217	Third Last Historical A_{B_Z}			cd

Table 5 (cont)

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JOB IMU PERFORMANCE TEST

JDC 12217 **REV.** L **PAGE** 1 **OF** 8
INITIAL TDRR 29882 **D.S. PGS** 43

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The three IRIG coefficient terms, BD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-
E	11-3-66	31779	4-6	2-6	EA	-
F	11-15-66	31938	-	1	EA	-
G	11-17-66	31932	3	-	EA	-
H	1-5-67	32494	1,2,5,6	1	EA	-
J	3-23-67	33377	All	All	EA	-
K	6-6-67	33909	2,4,5,6,7	2-4,19-21, 26-28	EA	-
L	7-21-67	34204	1,5,7,8	40,41,42,43	SB	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5. Record most recent historical values (up to three values) and test dates for coefficient terms BD, ADSRA, ADIA, ΔSF (A) and A_B from IRIG Inspection and Acceptance Data (last retest average value), ISS testing, prior runs of this JDC, or prior spacecraft testing.

2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not initialize a test position if less than 90 minutes remain before time of overflow.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the SCOPE by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Current Source Monitor panel to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Set the PIP and IRIG S.F. MONITOR switch to OFF and perform the following DSKY operations:

VERB 57 ENTR
00001 ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3). If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+18000 ENTR
To correct ROW 2 -
VERB 22 ENTR
Test site latitude from Table 3 ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00001 ENTR

+BDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00002 ENTR

+BDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

22A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00407 ENTR
c. 77757 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00411 ENTR
f. 00020 ENTR

-BDX + ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

23A. Perform the following DSKY operations:

a. VERB 06 NOUN 03 ENTR
b. 02530 ENTR
c. Record ROW 1 indication.
d. ENTR
e. 02531 ENTR
f. Record ROW 1 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR

To correct ROW 3 -
VERB 23 ENTR
+00003 ENTR

-BDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S. F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR

To correct ROW 3 -
VERB 23 ENTR
+00004 ENTR

+BDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

31A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00405 ENTR
c. 00020 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00407 ENTR
f. 77757 ENTR

+BDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

32A. Perform the following DSKY operations:

a. VERB 06 NOUN 03 ENTR
b. 02530 ENTR
c. Record ROW 1 indication.
d. ENTR
e. 02531 ENTR
f. Record ROW 1 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR

To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

+BDZ - ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR

To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+BDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-BDY + ADIAY

41. Calculate -BDZ - ADSRAZ as shown on data sheet.

-Y PIPA S. F. TEST

42. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

42A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00405 ENTR
c. 77757 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00411 ENTR
f. 00020 ENTR

NOTE: Read and understand step 43 before proceeding.

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 02637 ENTR
d. Enter the calculated value of -BDZ -ADSRAZ into the DSKY as ±XXX.XX and press the ENTR pushbutton.
e. VERB 06 NOUN 20 ENTR
f. Record exact time of pressing ENTR in e above.
g. Record ROW 1, ROW 2, and ROW 3 indications.
h. One hour after pressing ENTR in e above, press ENTR again.
i. Record exact time of pressing ENTR in h above.
j. Record ROW 1, ROW 2, and ROW 3 indications.
k. If KEY REL indicator on DSKY flashes press KEY REL pushbutton.
l. Observe
VERB 06 NOUN 66 Flashing
m. Record ROW 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Calculate coefficient terms BD, ADSRA, ADIA, ΔSF(A), and A_B. Record results.

48. Calculate coefficient stability terms D_1, D_2, and D_3 for each coefficient and record results as the initial values. (A total of four coefficient values are required in order to calculate a D_3 term.) If all stability term values are within the maximums given, record the results as the final values and proceed to the next step. If any stability term value exceeds the maximum given, retest the IMU by performing the retest sequence given in steps 50 through 55.

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49. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

RETEST SEQUENCE

NOTE: 1. The following steps are to be performed only if the stability values calculated in step 48 exceed maximum values on the initial run.

2. When prior engineering approval is obtained, a partial retest sequence may be performed which will repeat only those steps associated with the coefficient stability values that exceed the maximums. In this event the engineering approval should be shown in Table 6 and a copy of Table 6 attached to the completed data sheets.

50. Repeat steps 1 through 47 or, if engineering approval has veen obtained for a partial retest sequence, repeat the steps specified in Table 6 for the coefficient that exceeded stability value maximums. Record results on data sheet spaces provided.

51. Perform JDC 12204 to downmode system to ISS Standby.

52. Perform JDC 12204 to advance system to ISS Operate.

53. Repeat steps 1 through 47 or, if a partial retest sequence is being performed, repeat the steps specified in Table 6.

54. Calculate coefficient stability terms D_1, D_2, and D_3 for each coefficient and record results as the final values.

55. Return to step 49.

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JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST
TITLE ____________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____________ SER. NO. ______ CAL DATE ______
NAME ____________ SER. NO. ______ CAL DATE ______

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨	▨	▨
2.a	X PIPA G/S output	Volts p-p	▨		15		
2.b	Y PIPA G/S output	Volts p-p	▨		15		
2.c	Z PIPA G/S output	Volts p-p	▨		15		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts dc	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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EQUIPMENT TEST
DATA SHEET 2 OF 43

JDC
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	b
21	+BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	d
23	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e
23A.c	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
23A.f	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
26	-BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	g

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	i
32	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	j
32A.c	ROW 1 indication	deg	▨	__.___	▨	▨	▨	
32A.f	ROW 1 indication	deg	▨	__.___	▨	▨	▨	
36	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.__	▨	▨	▨	k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec²	▨	( )______. ( )______	▨	▨	▨	m
40	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	n
41	-BDZ - ADSRAZ = (line k) -2 (line c)	meru	▨	( )___.__	▨	▨	▨	p

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EQUIPMENT TEST
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JDC
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	-Y PIPA Test (ROW 1 indication) Position +00006 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	q
43.f	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
43.g	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
43.i	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
43.j	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
43.m	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	r

JDC ITEM NO.	CALCULATIONS	
47.a	BD_X = - (line f) = ( )	meru
47.b	BD_Y = line a = ( )	meru

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JDC ITEM NO.	CALCULATIONS	
47.c	BD_Z = line c = ( )	meru
47.d	$ADSRA_X$ = line n + line f = ( )	meru/g
47.e	$ADSRA_Y$ = line h - line a = ( )	meru/g
47.f	$ADSRA_Z$ = - (line k) + line c = ( )	meru/g
47.g	$ADIA_X$ = -1 [-(line e) + (line f)] = ( )	meru/g
47.h	$ADIA_Y$ = line r + line a = ( )	meru/g
47.i	$ADIA_Z$ = line j - line c = ( )	meru/g
47.j	g = ___.__ , (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \frac{2g \times 5.850000}{\text{line b - line d}}$	cm/sec/pulse
	$\Delta SF(A)_X = \frac{[SF(A)_X - 5.85] \times 10^6}{5.85}$	ppm

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
47.k	$SF(A)_Y = \frac{2g \times 5.850000}{\text{line m - line q}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \frac{[SF(A)_Y - 5.85] \times 10^6}{5.85}$	ppm
47.l	$SF(A)_Z = \frac{2g \times 5.850000}{\text{line g - line i}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \frac{[SF(A)_Z - 5.85] \times 10^6}{5.85}$	ppm
47.m	$A_{B_X} = \frac{\text{line b + line d}}{2}$	cm/sec^2
47.n	$A_{B_Y} = \frac{\text{line m + line q}}{2}$	cm/sec^2
47.o	$A_{B_Z} = \frac{\text{line i + line g}}{2}$	cm/sec^2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47.a	B_{D_X}	meru	-15.0		+15.0			s
47.b	B_{D_Y}	meru	-15.0		+15.0			t
47.c	B_{D_Z}	meru	-15.0		+15.0			u
47.d	$ADSRA_X$	meru/g	-40.0		+40.0			v
47.e	$ADSRA_Y$	meru/g	-40.0		+40.0			w
47.f	$ADSRA_Z$	meru/g	-40.0		+40.0			x
47.g	$ADIA_X$	meru/g	-100		+100			y
47.h	$ADIA_Y$	meru/g	-100		+100			z
47.i	$ADIA_Z$	meru/g	-100		+100			aa
47.j	$\Delta SF(A)_X$	ppm	-1900		+1900			ab
47.k	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac
47.l	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad
47.m	A_{B_X}	cm/sec^2	-2.20		+2.20			ae
47.n	A_{B_Y}	cm/sec^2	-2.20		+2.20			af
47.o	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag

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JDC ITEM NO.	CALCULATIONS	
48.a	$BD_XD_1 = \vert\text{line ah - line s}\vert$	meru
	$BD_XD_2 = D_1 + \vert\text{line ai - line ah}\vert$	meru
	$BD_XD_3 = D_2 + \vert\text{line aj - line ai}\vert$	meru
48.b	$BD_YD_1 = \vert\text{line as - line t}\vert$	meru
	$BD_YD_2 = D_1 + \vert\text{line at - line as}\vert$	meru
	$BD_YD_3 = D_2 + \vert\text{line au - line at}\vert$	meru
48.c	$BD_ZD_1 = \vert\text{line bb - line u}\vert$	meru
	$BD_ZD_2 = D_1 + \vert\text{line bc - line bb}\vert$	meru
	$BD_ZD_3 = D_2 + \vert\text{line bd - line bc}\vert$	meru

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JDC ITEM NO.	CALCULATIONS	
48.d	$\text{ADSRA}_X D_1 = \lvert \text{line ak} - \text{line v} \rvert$	meru/g
	$\text{ADSRA}_X D_2 = D_1 + \lvert \text{line am} - \text{line ak} \rvert$	meru/g
	$\text{ADSRA}_X D_3 = D_2 + \lvert \text{line an} - \text{line am} \rvert$	meru/g
48.e	$\text{ADSRA}_Y D_1 = \lvert \text{line av} - \text{line w} \rvert$	meru/g
	$\text{ADSRA}_Y D_2 = D_1 + \lvert \text{line aw} - \text{line av} \rvert$	meru/g
	$\text{ADSRA}_Y D_3 = D_2 + \lvert \text{line ax} - \text{line aw} \rvert$	meru/g
48.f	$\text{ADSRA}_Z D_1 = \lvert \text{line be} - \text{line x} \rvert$	meru/g
	$\text{ADSRA}_Z D_2 = D_1 + \lvert \text{line bf} - \text{line be} \rvert$	meru/g
	$\text{ADSRA}_Z D_3 = D_2 + \lvert \text{line bg} - \text{line bf} \rvert$	meru/g

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JDC ITEM NO.	CALCULATIONS	
48.g	$\text{ADIA}_X D_1 = \lvert \text{line ap} - \text{line y} \rvert$	meru/g
	$\text{ADIA}_X D_2 = D_1 + \lvert \text{line aq} - \text{line ap} \rvert$	meru/g
	$\text{ADIA}_X D_3 = D_2 + \lvert \text{line ar} - \text{line aq} \rvert$	meru/g
48.h	$\text{ADIA}_Y D_1 = \lvert \text{line ay} - \text{line z} \rvert$	meru/g
	$\text{ADIA}_Y D_2 = D_1 + \lvert \text{line az} - \text{line ay} \rvert$	meru/g
	$\text{ADIA}_Y D_3 = D_2 + \lvert \text{line ba} - \text{line az} \rvert$	meru/g
48.i	$\text{ADIA}_Z D_1 = \lvert \text{line bh} - \text{line aa} \rvert$	meru/g
	$\text{ADIA}_Z D_2 = D_1 + \lvert \text{line bi} - \text{line bh} \rvert$	meru/g
	$\text{ADIA}_Z D_3 = D_2 + \lvert \text{line bj} - \text{line bi} \rvert$	meru/g

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JDC ITEM NO.	CALCULATIONS	
48.j	$\Delta\ \text{SF(A)}_X D_1 = \lvert \text{line bk} - \text{line ab} \rvert$	ppm
	$\Delta\ \text{SF(A)}_X D_2 = D_1 + \lvert \text{line bm} - \text{line bk} \rvert$	ppm
	$\Delta\ \text{SF(A)}_X D_3 = D_2 + \lvert \text{line bn} - \text{line bm} \rvert$	ppm
48.k	$\Delta\ \text{SF(A)}_Y D_1 = \lvert \text{line bs} - \text{line ac} \rvert$	ppm
	$\Delta\ \text{SF(A)}_Y D_2 = D_1 + \lvert \text{line bt} - \text{line bs} \rvert$	ppm
	$\Delta\ \text{SF(A)}_Y D_3 = D_2 + \lvert \text{line bu} - \text{line bt} \rvert$	ppm
48.l	$\Delta\ \text{SF(A)}_Z D_1 = \lvert \text{line by} - \text{line ad} \rvert$	ppm
	$\Delta\ \text{SF(A)}_Z D_2 = D_1 + \lvert \text{line bz} - \text{line by} \rvert$	ppm
	$\Delta\ \text{SF(A)}_Z D_3 = D_2 + \lvert \text{line ca} - \text{line bz} \rvert$	ppm

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JDC ITEM NO.	CALCULATIONS	
48.m	$A_{B_X} D_1 = \lvert \text{line bp} - \text{line ae} \rvert$	cm/sec^2
	$A_{B_X} D_2 = D_1 + \lvert \text{line bq} - \text{line bp} \rvert$	cm/sec^2
	$A_{B_X} D_3 = D_2 + \lvert \text{line br} - \text{line bq} \rvert$	cm/sec^2
48.n	$A_{B_Y} D_1 = \lvert \text{line bv} - \text{line af} \rvert$	cm/sec^2
	$A_{B_Y} D_2 = D_1 + \lvert \text{line bw} - \text{line bv} \rvert$	cm/sec^2
	$A_{B_Y} D_3 = D_2 + \lvert \text{line bx} - \text{line bw} \rvert$	cm/sec^2
48.o	$A_{B_Z} D_1 = \lvert \text{line cb} - \text{line ag} \rvert$	cm/sec^2
	$A_{B_Z} D_2 = D_1 + \lvert \text{line cc} - \text{line cb} \rvert$	cm/sec^2
	$A_{B_Z} D_3 = D_2 + \lvert \text{line cd} - \text{line cc} \rvert$	cm/sec^2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.a	Initial BD_XD_1	meru	▨		6.0	▨	▨
	Initial BD_XD_2	meru	▨		9.0	▨	▨
	Initial BD_XD_3	meru	▨		11.0	▨	▨
48.a	Final BD_XD_1	meru	▨		6.0		
or	Final BD_XD_2	meru	▨		9.0		
54.a	Final BD_XD_3	meru	▨		11.0		
48.b	Initial BD_YD_1	meru	▨		6.0	▨	▨
	Initial BD_YD_2	meru	▨		9.0	▨	▨
	Initial BD_YD_3	meru	▨		11.0	▨	▨
48.b	Final BD_YD_1	meru	▨		6.0		
or	Final BD_YD_2	meru	▨		9.0		
54.b	Final BD_YD_3	meru	▨		11.0		
48.c	Initial BD_ZD_1	meru	▨		6.0	▨	▨
	Initial BD_ZD_2	meru	▨		9.0	▨	▨
	Initial BD_ZD_3	meru	▨		11.0	▨	▨
48.c	Final BD_ZD_1	meru	▨		6.0		
or	Final BD_ZD_2	meru	▨		9.0		
54.c	Final BD_ZD_3	meru	▨		11.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.d	Initial $ADSRA_XD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_XD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_XD_3$	meru/g	▨		25.0	▨	▨
48.d	Final $ADSRA_XD_1$	meru/g	▨		14.0		
or	Final $ADSRA_XD_2$	meru/g	▨		21.0		
54.d	Final $ADSRA_XD_3$	meru/g	▨		25.0		
48.e	Initial $ADSRA_YD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_YD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_YD_3$	meru/g	▨		25.0	▨	▨
48.e	Final $ADSRA_YD_1$	meru/g	▨		14.0		
or	Final $ADSRA_YD_2$	meru/g	▨		21.0		
54.e	Final $ADSRA_YD_3$	meru/g	▨		25.0		
48.f	Initial $ADSRA_ZD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_ZD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_ZD_3$	meru/g	▨		25.0	▨	▨
48.f	Final $ADSRA_ZD_1$	meru/g	▨		14.0		
or	Final $ADSRA_ZD_2$	meru/g	▨		21.0		
54.f	Final $ADSRA_ZD_3$	meru/g	▨		25.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.g	Initial $ADIA_XD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_XD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_XD_3$	meru/g	▨		40.0	▨	▨
48.g	Final $ADIA_XD_1$	meru/g	▨		17.0		
or	Final $ADIA_XD_2$	meru/g	▨		33.0		
54.g	Final $ADIA_XD_3$	meru/g	▨		40.0		
48.h	Initial $ADIA_YD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_YD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_YD_3$	meru/g	▨		40.0	▨	▨
48.h	Final $ADIA_YD_1$	meru/g	▨		17.0		
or	Final $ADIA_YD_2$	meru/g	▨		33.0		
54.h	Final $ADIA_YD_3$	meru/g	▨		40.0		
48.i	Initial $ADIA_ZD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_ZD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_ZD_3$	meru/g	▨		40.0	▨	▨
48.i	Final $ADIA_ZD_1$	meru/g	▨		17.0		
or	Final $ADIA_ZD_2$	meru/g	▨		33.0		
54.i	Final $ADIA_ZD_3$	meru/g	▨		40.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.j	Initial $\Delta SF(A)_XD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_XD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_XD_3$	ppm	▨		600	▨	▨
48.j	Final $\Delta SF(A)_XD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_XD_2$	ppm	▨		500		
54.j	Final $\Delta SF(A)_XD_3$	ppm	▨		600		
48.k	Initial $\Delta SF(A)_YD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_YD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_YD_3$	ppm	▨		600	▨	▨
48.k	Final $\Delta SF(A)_YD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_YD_2$	ppm	▨		500		
54.k	Final $\Delta SF(A)_YD_3$	ppm	▨		600		
48.l	Initial $\Delta SF(A)_ZD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_ZD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_ZD_3$	ppm	▨		600	▨	▨
48.l	Final $\Delta SF(A)_ZD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_ZD_2$	ppm	▨		500		
54.l	Final $\Delta SF(A)_ZD_3$	ppm	▨		600		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.m	Initial $A_{B_X}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_X}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_X}D_3$	cm/sec^2	▨		0.90	▨	▨
48.m	Final $A_{B_X}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_X}D_2$	cm/sec^2	▨		0.70		
54.m	Final $A_{B_X}D_3$	cm/sec^2	▨		0.90		
48.n	Initial $A_{B_Y}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_Y}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_Y}D_3$	cm/sec^2	▨		0.90	▨	▨
48.n	Final $A_{B_Y}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_Y}D_2$	cm/sec^2	▨		0.70		
54.n	Final $A_{B_Y}D_3$	cm/sec^2	▨		0.90		
48.o	Initial $A_{B_Z}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_Z}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_Z}D_3$	cm/sec^2	▨		0.90	▨	▨

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.o	Final $A_{B_Z}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_Z}D_2$	cm/sec^2	▨		0.70		
54.o	Final $A_{B_Z}D_3$	cm/sec^2	▨		0.90		
50 (1)	Gyro WHEEL	Time	▨		▨	▨	▨
50 (2.a)	X PIPA G/S output	Volts p-p	▨		15		
50 (2.b)	Y PIPA G/S output	Volts p-p	▨		15		
50 (2.c)	Z PIPA G/S output	Volts p-p	▨		15		
50 (6.f.1)	X PIPA PVR	Volts dc	5.94		6.06		
50 (6.f.2)	Y PIPA PVR	Volts dc	5.94		6.06		
50 (6.f.3)	Z PIPA PVR	Volts dc	5.94		6.06		
50 (11)	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (17)	+BDY (ROW 2 indication) Position +00001	meru	▨	( ) ___ . __	▨	▨	▨	a.1
50 (18)	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( ) _____ . ( ) _____	▨	▨	▨	b.1
50 (21)	+BDZ (ROW 2 indication) Position +00002	meru	▨	( ) ___ . __	▨	▨	▨	c.1
50 (22)	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( ) _____ . ( ) _____	▨	▨	▨	d.1
50 (23)	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( ) ___ . __	▨	▨	▨	e.1
50 (23A.c)	ROW 1 indication	deg	▨	___ . __	▨	▨	▨	
50 (23A.f)	ROW 1 indication	deg	▨	___ . __	▨	▨	▨	
50 (26)	-BDX (ROW 2 indication) Position +00003	meru	▨	( ) ___ . __	▨	▨	▨	f.1
50 (27)	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( ) _____ . ( ) _____	▨	▨	▨	g.1

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (30)	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( ) ___ . __	▨	▨	▨	h.1
50 (31)	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2	▨	( ) _____ . ( ) _____	▨	▨	▨	i.1
50 (32)	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( ) ___ . __	▨	▨	▨	j.1
50 (32A.c)	ROW 1 indication	deg	▨	___ . __	▨	▨	▨	
50 (32A.f)	ROW 1 indication	deg	▨	___ . __	▨	▨	▨	
50 (36)	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( ) ___ . __	▨	▨	▨	k.1
50 (37)	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2	▨	( ) _____ . ( ) _____	▨	▨	▨	m.1
50 (40)	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( ) ___ . __	▨	▨	▨	n.1
50 (41)	-BDZ - ADSRAZ = (line k.1) -2 (line c.1) =	meru	▨	( ) ___ . __	▨	▨	▨	p.1

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (42)	-Y PIPA Test (ROW 1 indication) Position + 00006 (ROW 2 indication)	cm/sec^2	▨	( )_ _ _ _ _. ( )_ _ _ _ _.	▨	▨	▨	q.1
50 (43.f)	Time of ENTR	Time	▨	_ _hrs_ _min_ _sec	▨	▨	▨	
50 (43.g)	ROW 1 indication	deg	▨	( )_ _ _. _ _	▨	▨	▨	
	ROW 2 indication	deg	▨	( )_ _ _. _ _	▨	▨	▨	
	ROW 3 indication	deg	▨	( )_ _ _. _ _	▨	▨	▨	
50 (43.i)	Time of ENTR	Time	▨	_ _hrs_ _min_ _sec	▨	▨	▨	
50 (43.j)	ROW 1 indication	deg	▨	( )_ _ _. _ _	▨	▨	▨	
	ROW 2 indication	deg	▨	( )_ _ _. _ _	▨	▨	▨	
	ROW 3 indication	deg	▨	( )_ _ _. _ _	▨	▨	▨	
50 (43.m)	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )_ _ _. _ _	▨	▨	▨	r.1

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JDC ITEM NO.	CALCULATIONS
50 (47.a)	BD_X = - (line f.1) = ( ) meru
50 (47.b)	BD_Y = line a.1 = ( ) meru
50 (47.c)	BD_Z = line c.1 = ( ) meru
50 (47.d)	$ADSRA_X$ = line n.1 + line f.1 = ( ) meru/g
50 (47.e)	$ADSRA_Y$ = line h.1 - line a.1 = ( ) meru/g

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JDC ITEM NO.	CALCULATIONS
50 (47.f)	$ADSRA_Z$ = - (line k.1) + line c.1 = ( ) meru/g
50 (47.g)	$ADIA_X$ = -1 [(line e.1) + (line f.1)] = ( ) meru/g
50 (47.h)	$ADIA_Y$ = line r.1 + line a.1 = ( ) meru/g
50 (47.i)	$ADIA_Z$ = line j.1 - line c.1 = ( ) meru/g
50 (47.j)	g = _ _ _. _ _ (Enter local gravity from Table 4) cm/sec^2
	$SF(A)_X = \frac{2g \times 5.850000}{\text{line b.1 - line d.1}}$ cm/sec/pulse
	$\Delta SF(A)_X = \frac{[SF(A)_X - 5.85] \times 10^6}{5.85}$ ppm

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NO. 12217
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JDC ITEM NO.	CALCULATIONS
50 (47.k)	$SF(A)_Y = \frac{2g \times 5.850000}{\text{line m.1 - line q.1}}$ cm/sec/pulse
	$\Delta SF(A)_Y = \frac{[SF(A)_Y - 5.85] \times 10^6}{5.85}$ ppm
50 (47.l)	$SF(A)_Z = \frac{2g \times 5.850000}{\text{line g.1 - line i.1}}$ cm/sec/pulse
	$\Delta SF(A)_Z = \frac{[SF(A)_Z - 5.85] \times 10^6}{5.85}$ ppm
50 (47.m)	$A_{B_X} = \frac{\text{line b.1 + line d.1}}{2}$ cm/sec^2
50 (47.n)	$A_{B_Y} = \frac{\text{line m.1 + line q.1}}{2}$ cm/sec^2
50 (47.o)	$A_{B_Z} = \frac{\text{line i.1 + line g.1}}{2}$ cm/sec^2

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JDC
NO. 12217
REV. L

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (47.a)	B_{D_X}	meru	-15.0		+15.0			s.1
50 (47.b)	B_{D_Y}	meru	-15.0		+15.0			t.1
50 (47.c)	B_{D_Z}	meru	-15.0		+15.0			u.1
50 (47.d)	$ADSRA_X$	meru/g	-40.0		+40.0			v.1
50 (47.e)	$ADSRA_Y$	meru/g	-40.0		+40.0			w.1
50 (47.f)	$ADSRA_Z$	meru/g	-40.0		+40.0			x.1
50 (47.g)	$ADIA_X$	meru/g	-100		+100			y.1
50 (47.h)	$ADIA_Y$	meru	-100		+100			z.1
50 (47.i)	$ADIA_Z$	meru/g	-100		+100			aa.1
50 (47.j)	$\Delta SF(A)_X$	ppm	-1900		+1900			ab.1
50 (47.k)	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac.1
50 (47.l)	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad.1

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JDC
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (47.m)	A_{B_X}	cm/sec^2	-2.20		+2.20			ae.1
50 (47.n)	A_{B_Y}	cm/sec^2	-2.20		+2.20			af.1
50 (47.o)	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag.1
53 (1)	Gyro WHEEL	Time	▨		▨	▨	▨	
53 (2.a)	X PIPA G/S output	Volts p-p	▨		15			
53 (2.b)	Y PIPA G/S output	Volts p-p	▨		15			
53 (2.c)	Z PIPA G/S output	Volts p-p	▨		15			
53 (6.f.1)	X PIPA PVR	Volts dc	5.94		6.06			
53 (6.f.2)	Y PIPA PVR	Volts dc	5.94		6.06			
53 (6.f.3)	Z PIPA PVR	Volts dc	5.94		6.06			
53 (11)	X PIPA TCM	Volts dc	0.98		1.08			
	Y PIPA TCM	Volts dc	0.98		1.08			

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (11) (cont)	Z PIPA TCM	Volts dc	0.98		1.08			
53 (17)	+BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a.2
53 (18)	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	b.2
53 (21)	+BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c.2
53 (22)	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	d.2
53 (23)	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e.2
53 (23A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (23A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (26)	-BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f.2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (27)	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	g.2
53 (30)	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	h.2
53 (31)	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	i.2
53 (32)	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	j.2
53 (32A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (32A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (36)	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.__	▨	▨	▨	k.2
53 (37)	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	m.2
53 (40)	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	n.2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (41)	-BDZ - ADSRAZ =. (line k.2) -2 (line c.2) =	meru	▨	( )___.__	▨	▨	▨	p.2
53 (42)	-Y PIPA Test (ROW 1 indication) Position +00006 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	q.2
53 (43.f)	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
53 (43.g)	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
53 (43.i)	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
53 (43.j)	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
53 (43.m)	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	r.2

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JDC ITEM NO.	CALCULATIONS	
53 (47.a)	$BD_X = -$ (line f.2) = ( )	meru
53 (47.b)	BD_Y = line a.2 = ( )	meru
53 (47.c)	BD_Z = line c.2 = ( )	meru
53 (47.d)	$ADSRA_X$ = line n.2 + line f.2 = ( )	meru/g

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
53 (47.e)	$ADSRA_Y$ = line h.2 - line a.2 = ( )	meru/g
53 (47.f)	$ADSRA_Z = -$ (line k.2) + line c.2 = ( )	meru/g
53 (47.g)	$ADIA_X = -1 \left[-(\text{line e.2}) + (\text{line f.2}) \right] = (\ )$	meru/g
53 (47.h)	$ADIA_Y$ = line r.2 + line a.2 = ( )	meru/g
53 (47.i)	$ADIA_Z$ = line j.2 - line c.2 = ( )	meru/g
53 (47.j)	g = ___.__ (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \dfrac{2g \times 5.850000}{\text{line b.2} - \text{line d.2}}$	cm/sec/pulse
	$\Delta SF(A)_X = \dfrac{\left[SF(A)_X - 5.85\right] \times 10^6}{5.85}$	ppm

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
53 (47.k)	$SF(A)_Y = \dfrac{2g \times 5.850000}{\text{line m.2} - \text{line q.2}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \dfrac{\left[SF(A)_Y - 5.85\right] \times 10^6}{5.85}$	ppm
53 (47.l)	$SF(A)_Z = \dfrac{2g \times 5.850000}{\text{line g.2} - \text{line i.2}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \dfrac{\left[SF(A)_Z - 5.85\right] \times 10^6}{5.85}$	ppm
53 (47.m)	${}^{A}B_X = \dfrac{\text{line b.2} + \text{line d.2}}{2}$	cm/sec^2
53 (47.n)	${}^{A}B_Y = \dfrac{\text{line m.2} + \text{line q.2}}{2}$	cm/sec^2
53 (47.o)	${}^{A}B_Z = \dfrac{\text{line i.2} + \text{line g.2}}{2}$	cm/sec^2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (47.a)	B_{D_X}	meru	-15.0		+15.0			s.2
53 (47.b)	B_{D_Y}	meru	-15.0		+15.0			t.2
53 (47.c)	B_{D_Z}	meru	-15.0		+15.0			u.2
53 (47.d)	$ADSRA_X$	meru/g	-40.0		+40.0			v.2
53 (47.e)	$ADSRA_Y$	meru/g	-40.0		+40.0			w.2
53 (47.f)	$ADSRA_Z$	meru/g	-40.0		+40.0			x.2
53 (47.g)	$ADIA_X$	meru/g	-100		+100			y.2
53 (47.h)	$ADIA_Y$	meru/g	-100		+100			z.2
53 (47.i)	$ADIA_Z$	meru/g	-100		+100			aa.2
53 (47.j)	$\Delta SF(A)_X$	ppm	-1900		+1900			ab.2
53 (47.k)	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac.2
53 (47.l)	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad.2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (47.m)	A_{B_X}	cm/sec^2	-2.20		+2.20			ae.2
53 (47.n)	A_{B_Y}	cm/sec^2	-2.20		+2.20			af.2
53 (47.o)	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag.2

JDC ITEM NO.	CALCULATIONS	
54.a	$BD_XD_1 = \left|\text{line s.1 - line s.2}\right|$	meru
	$BD_XD_2 = D_1 + \left|\text{line s - line s.1}\right|$	meru
	$BD_XD_3 = D_2 + \left|\text{line ah - line s}\right|$	meru
54.b	$BD_YD_1 = \left|\text{line t.1 - line t.2}\right|$	meru
	$BD_YD_2 = D_1 + \left|\text{line t - line t.1}\right|$	meru
	$BD_YD_3 = D_2 + \left|\text{line as - line t}\right|$	meru

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JDC ITEM NO.	CALCULATIONS	
54.c	$BD_ZD_1 = \left|\text{line u.1 - line u.2}\right|$	meru
	$BD_ZD_2 = D_1 + \left|\text{line u - line u.1}\right|$	meru
	$BD_ZD_3 = D_2 + \left|\text{line bb - line u}\right|$	meru
54.d	$ADSRA_XD_1 = \left|\text{line v.1 - line v.2}\right|$	meru/g
	$ADSRA_XD_2 = D_1 + \left|\text{line v - line v.1}\right|$	meru/g
	$ADSRA_XD_3 = D_2 + \left|\text{line ak - line v}\right|$	meru/g
54.e	$ADSRA_YD_1 = \left|\text{line w.1 - line w.2}\right|$	meru/g
	$ADSRA_YD_2 = D_1 + \left|\text{line w - line w.1}\right|$	meru/g
	$ADSRA_YD_3 = D_2 + \left|\text{line av - line w}\right|$	meru/g

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
54.f	$ADSRA_ZD_1 = \left|\text{line x.1 - line x.2}\right|$	meru/g
	$ADSRA_ZD_2 = D_1 + \left|\text{line x - line x.1}\right|$	meru/g
	$ADSRA_ZD_3 = D_2 + \left|\text{line be - line x}\right|$	meru/g
54.g	$ADIA_XD_1 = \left|\text{line y.1 - line y.2}\right|$	meru/g
	$ADIA_XD_2 = D_1 + \left|\text{line y - line y.1}\right|$	meru/g
	$ADIA_XD_3 = D_2 + \left|\text{line ap - line y}\right|$	meru/g
54.h	$ADIA_YD_1 = \left|\text{line z.1 - line z.2}\right|$	meru/g
	$ADIA_YD_2 = D_1 + \left|\text{line z - line z.1}\right|$	meru/g
	$ADIA_YD_3 = D_2 + \left|\text{line ay - line z}\right|$	meru/g

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JDC ITEM NO.	CALCULATIONS	
54.i	$ADIA_Z D_1 = \lvert \text{line aa.1} - \text{line aa.2} \rvert$	meru/g
	$ADIA_Z D_2 = D_1 + \lvert \text{line aa} - \text{line aa.1} \rvert$	meru/g
	$ADIA_Z D_3 = D_2 + \lvert \text{line bh} - \text{line aa} \rvert$	meru/g
54.j	$\Delta SF(A)_X D_1 = \lvert \text{line ab.1} - \text{line ab.2} \rvert$	ppm
	$\Delta SF(A)_X D_2 = D_1 + \lvert \text{line ab} - \text{line ab.1} \rvert$	ppm
	$\Delta SF(A)_X D_3 = D_2 + \lvert \text{line bk} - \text{line ab} \rvert$	ppm
54.k	$\Delta SF(A)_Y D_1 = \lvert \text{line ac.1} - \text{line ac.2} \rvert$	ppm
	$\Delta SF(A)_Y D_2 = D_1 + \lvert \text{line ae} - \text{line ac.1} \rvert$	ppm
	$\Delta SF(A)_Y D_3 = D_2 + \lvert \text{line bs} - \text{line ac} \rvert$	ppm

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JDC ITEM NO.	CALCULATIONS	
54.1	$\Delta SF(A)_Z D_1 = \lvert \text{line ad.1} - \text{line ad.2} \rvert$	ppm
	$\Delta SF(A)_Z D_2 = D_1 + \lvert \text{line ad} - \text{line ad.1} \rvert$	ppm
	$\Delta SF(A)_Z D_3 = D_2 + \lvert \text{line by} - \text{line ad} \rvert$	ppm
54.m	$A_{B_X} D_1 = \lvert \text{line ae.1} - \text{line ae.2} \rvert$	cm/sec^2
	$A_{B_X} D_2 = D_1 + \lvert \text{line ae} - \text{line ae.1} \rvert$	cm/sec^2
	$A_{B_X} D_3 = D_2 + \lvert \text{line bp} - \text{line ae} \rvert$	cm/sec^2
54.n	$A_{B_Y} D_1 = \lvert \text{line af.1} - \text{line af.2} \rvert$	cm/sec^2
	$A_{B_Y} D_2 = D_1 + \lvert \text{line af} - \text{line af.1} \rvert$	cm/sec^2
	$A_{B_Y} D_3 = D_2 + \lvert \text{line bv} - \text{line af} \rvert$	cm/sec^2

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JDC ITEM NO.	CALCULATIONS	
54.o	$A_{B_Z} D_1 = \lvert \text{line ag.1} - \text{line ag.2} \rvert$	cm/sec^2
	$A_{B_Z} D_2 = D_1 + \lvert \text{line ag} - \text{line ag.1} \rvert$	cm/sec^2
	$A_{B_Z} D_3 = D_2 + \lvert \text{line cb} - \text{line ag} \rvert$	cm/sec^2

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4.

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TEST	COEFFICIENT	VALUE	TEST DATE	
IRIG I & A JDC 16236 JDC 12217 Spacecraft	(EXAMPLE) Last Historical BD_X	+1.46	3/8/67	
	(EXAMPLE) Second Last Historical BD_X	+1.09	2/15/67	
	(EXAMPLE) Third Last Historical BD_X	-0.29	1/24/67	
IRIG I & A JDC 16236 JDC 12217 Spacecraft	Last Historical BD_X			ah
	Second Last Historical BD_X			ai
	Third Last Historical BD_X			aj
IRIG I & A JDC 16236 JDC 12217 Spacecraft	Last Historical $ADSRA_X$			ak
	Second Last Historical $ADSRA_X$			am
	Third Last Historical $ADSRA_X$			an
IRIG I & A JDC 16237 JDC 12217 Spacecraft	Last Historical $ADIA_X$			ap
	Second Last Historical $ADIA_X$			aq
	Third Last Historical $ADIA_X$			ar
IRIG I & A JDC 16239 JDC 12217 Spacecraft	Last Historical BD_Y			as
	Second Last Historical BD_Y			at
	Third Last Historical BD_Y			au

Table 5

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TEST	COEFFICIENT	VALUE	TEST DATE	
IRIG I & A JDC 16239 JDC 12217 Spacecraft	Last Historical ADSRA$_Y$			av
	Second Last Historical ADSRA$_Y$			aw
	Third Last Historical ADSRA$_Y$			ax
IRIG I & A JDC 16240 JDC 12217 Spacecraft	Last Historical ADIA$_Y$			ay
	Second Last Historical ADIA$_Y$			az
	Third Last Historical ADIA$_Y$			ba
IRIG I & A JDC 16242 JDC 12217 Spacecraft	Last Historical BD$_Z$			bb
	Second Last Historical BD$_Z$			bc
	Third Last Historical BD$_Z$			bd
IRIG I & A JDC 16242 JDC 12217 Spacecraft	Last Historical ADSRA$_Z$			be
	Second Last Historical ADSRA$_Z$			bf
	Third Last Historical ADSRA$_Z$			bg
IRIG I & A JDC 16243 JDC 12217 Spacecraft	Last Historical ADIA$_Z$			bh
	Second Last Historical ADIA$_Z$			bi
	Third Last Historical ADIA$_Z$			bj
JDC 14155 JDC 14201 JDC 12217 Spacecraft	Last Historical ΔSF(A)$_X$			bk
	Second Last Historical ΔSF(A)$_X$			bm
	Third Last Historical ΔSF(A)$_X$			bn

Table 5 (cont)

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JOB IMU PERFORMANCE TEST

JDC		VALUE	TEST DATE	
JDC 14155 JDC 14201 JDC 12217 Spacecraft	Last Historical A$_{B_X}$			bp
	Second Last Historical A$_{B_X}$			bq
	Third Last Historical A$_{B_X}$			br
JDC 14156 JDC 14203 JDC 12217 Spacecraft	Last Historical ΔSF(A)$_Y$			bs
	Second Last Historical ΔSF(A)$_Y$			bt
	Third Last Historical ΔSF(A)$_Y$			bu
JDC 14156 JDC 14203 JDC 12217 Spacecraft	Last Historical A$_{B_Y}$			bv
	Second Last Historical A$_{B_Y}$			bw
	Third Last Historical A$_{B_Y}$			bx
JDC 14157 JDC 14205 JDC 12217 Spacecraft	Last Historical ΔSF(A)$_Z$			by
	Second Last Historical ΔSF(A)$_Z$			bz
	Third Last Historical ΔSF(A)$_Z$			ca
JDC 14157 JDC 14205 JDC 12217 Spacecraft	Last Historical A$_{B_Z}$			cb
	Second Last Historical A$_{B_Z}$			cc
	Third Last Historical A$_{B_Z}$			cd

Table 5 (cont)

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JDC
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JOB

COEFFICIENT	JDC STEPS TO BE PREPARED																																				
	1→14	15	16	17	18	19	20	21	Ⓐ	22	22A	23	23A	24	25	26	27	28	29	30	31	31A	32	32A	33	34	35	36	37	38	39	40	41	42	42A	43	Eng Approval
BD$_X$	x														x	x																					
BD$_Y$	x	x	x	x																																	
BD$_Z$	x						x	x																													
ADSRA$_X$	x														x	x											x			x	x	x					
ADSRA$_Y$	x	x	x	x														x	x	x																	
ADSRA$_Z$	x						x	x	x																	x	x	x									
ADIA$_X$	x	x	x	x		x	x	x		x	x	x	x	x	x	x																					
ADIA$_Y$	x	x	x	x		x	x	x	x																	x	x	x		x	x	x	x	x	x	x	
ADIA$_Z$	x						x	x	x						x	x		x	x	x	x	x	x	x													
AB$_X$ or ΔSF$_X$	x	x	x	x	x	x	x	x		x																											
AB$_Z$ or ΔSF$_Y$	x																									x	x	x	x	x	x	x		x			
AB$_Z$ or ΔSF$_Z$	x														x	x	x	x	x	x	x																

Ⓐ Perform the following DSKY Operation:
VERB 34, PRESS ENTR

Table 6

DATE 30 JUN 66

JOB IMU PERFORMANCE TEST

JDC 12217 **REV.** M **PAGE** 1 **OF** 8

INITIAL TDRR 29882 **D.S. PGS** 43

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The three IRIG coefficient terms, BD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7, 8	EA	-
B	9-15-66	31051	-	5, 8	EA	-
C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-
E	11-3-66	31779	4-6	2-6	EA	-
F	11-15-66	31938	-	1	EA	-
G	11-17-66	31932	3	-	EA	-
H	1-5-67	32494	1, 2, 5, 6	1	EA	-
J	3-23-67	33377	All	All	EA	-
K	6-6-67	33909	2, 4, 5, 6, 7	2-4, 19-21, 26-28	EA	-
L	7-21-67	34204	1, 5, 7, 8	40, 41, 42, 43	SB	-
M	10-26-67	34931	1, 8	3, 43	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5. Record most recent historical values (up to three values) and test dates for coefficient terms BD, ADSRA, ADIA, ΔSF (A) and A_B from IRIG Inspection and Acceptance Data (last retest average value), ISS testing, prior runs of this JDC, or prior spacecraft testing.

2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not initialize a test position if less than 90 minutes remain before time of overflow.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the Dual Beam Oscilloscope by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

	SIGNAL	CROSSBAR CONTROL
a.	X PIPA G/S output	251
b.	Y PIPA G/S output	152
c.	Z PIPA G/S output	252

VERIFICATION WITH SIDL REQUIRED BEFORE USE

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE.

5. Adjust the VOLTAGE ratio transformer on the Current Source Monitor panel to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Set the PIP and IRIG S. F. MONITOR switch to OFF and perform the following DSKY operations:

VERB 57	ENTR
00001	ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3). If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+18000	ENTR

To correct ROW 2 -

VERB 22	ENTR
Test site latitude from Table 3	ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00001	ENTR

+BDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00002	ENTR

+BDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

22A. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	00407		ENTR
c.	77757		ENTR
d.	VERB 21	NOUN 01	ENTR
e.	00411		ENTR
f.	00020		ENTR

-BDX + ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

23A. Perform the following DSKY operations:

a.	VERB 06	NOUN 03	ENTR
b.	02530		ENTR
c.	Record ROW 1 indication.		
d.			ENTR
e.	02531		ENTR
f.	Record ROW 1 indication.		

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -
VERB 23 ENTR
+00003 ENTR

-BDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S.F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00004 ENTR

+BDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Z PIPA S.F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

31A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00405 ENTR
c. 00020 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00407 ENTR
f. 77757 ENTR

+BDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

32A. Perform the following DSKY operations:

a. VERB 06 NOUN 03 ENTR
b. 02530 ENTR
c. Record ROW 1 indication.
d. ENTR
e. 02531 ENTR
f. Record ROW 1 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

+BDZ - ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+BDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-BDY + ADIAY

41. Calculate -BDZ - ADSRAZ as shown on data sheet.

-Y PIPA S.F. TEST

42. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

42A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00405 ENTR
c. 77757 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00411 ENTR
f. 00020 ENTR

NOTE: Read and understand step 43 before proceeding.

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 02637 ENTR
d. Enter the calculated value of -BDZ -ADSRAZ into the DSKY as ±XXX.XX and press the ENTR pushbutton.
e. VERB 06 NOUN 20 ENTR
f. Record exact time of pressing ENTR in e above.
g. Record ROW 1, ROW 2, and ROW 3 indications.
h. One hour after pressing ENTR in e above, press ENTR again.
i. Record exact time of pressing ENTR in h above.
j. Record ROW 1, ROW 2, and ROW 3 indications.
k. If KEY REL indicator on DSKY flashes press KEY REL pushbutton.
l. Observe
VERB 06 NOUN 66 Flashing
m. Record ROW 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Calculate coefficient terms BD, ADSRA, ADIA, ΔSF(A), and A_B. Record results.

48. Calculate coefficient stability terms D_1, D_2, and D_3 for each coefficient and record results as the initial values. (A total of four coefficient values are required in order to calculate a D_3 term.) If all stability term values are within the maximums given, record the results as the final values and proceed to the next step. If any stability term value exceeds the maximum given, retest the IMU by performing the retest sequence given in steps 50 through 55.

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49. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

RETEST SEQUENCE

NOTE: 1. The following steps are to be performed only if the stability values calculated in step 48 exceed maximum values on the initial run.

2. When prior engineering approval is obtained, a partial retest sequence may be performed which will repeat only those steps associated with the coefficient stability values that exceed the maximums. In this event the engineering approval should be shown in Table 6 and a copy of Table 6 attached to the completed data sheets.

50. Repeat steps 1 through 47 or, if engineering approval has been obtained for a partial retest sequence, repeat the steps and calculate the parameters specified in Table 6 for the coefficient that exceeded stability value maximums. Record results on data sheet spaces provided.

51. Perform JDC 12204 to downmode system to ISS Standby.

52. Perform JDC 12204 to advance system to ISS Operate.

53. Repeat steps 1 through 47 or, if a partial retest sequence is being performed, repeat the steps and calculate the parameters specified in Table 6.

54. Calculate coefficient stability terms D_1, D_2, and D_3 for each coefficient and record results as the final values.

55. Return to step 49.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 43

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NO. 12217
REV. M
INITIAL TDRR 29882

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ____ CAL DATE
NAME ______ SER. NO. ____ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨	▨	▨
2.a	X PIPA G/S output	Volts p-p	▨		15		
2.b	Y PIPA G/S output	Volts p-p	▨		15		
2.c	Z PIPA G/S output	Volts p-p	▨		15		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts dc	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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EQUIPMENT TEST
DATA SHEET 2 OF 43

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	b
21	+BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	d
23	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e
23A.c	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
23A.f	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
26	-BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	g

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EQUIPMENT TEST
DATA SHEET 3 OF 43

JDC
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	i
32	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	j
32A.c	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
32A.f	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
36	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.__	▨	▨	▨	k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	m
40	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	n
41	-BDZ - ADSRAZ = (line k) -2 (line c)	meru	▨	( )___.__	▨	▨	▨	p

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EQUIPMENT TEST
DATA SHEET 4 OF 43

JDC
NO. 12217
REV. M

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	-Y PIPA Test (ROW 1 indication) Position +00006 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	q
43.f	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
43.g	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
43.i	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
43.j	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
43.m	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	r

JDC ITEM NO.	CALCULATIONS	
47.a	BD_X = - (line f) = ( )	meru
47.b	BD_Y = line a = ( )	meru

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
47.c	BD_Z = line c = ( )	meru
47.d	$ADSRA_X$ = line n + line f = ( )	meru/g
47.e	$ADSRA_Y$ = line h - line a = ( )	meru/g
47.f	$ADSRA_Z$ = - (line k) + line c = ( )	meru/g
47.g	$ADIA_X$ = -1 [-(line e) + (line f)] = ( )	meru/g
47.h	$ADIA_Y$ = line r + line a = ( )	meru/g
47.i	$ADIA_Z$ = line j - line c = ( )	meru/g
47.j	g = ___.__ (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \dfrac{2g \times 5.850000}{\text{line b - line d}}$	cm/sec/pulse
	$\Delta SF(A)_X = \dfrac{[SF(A)_X - 5.85] \times 10^6}{5.85}$	ppm

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EQUIPMENT TEST
DATA SHEET 6 **OF** 43

JDC NO. 12217
REV. M

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
47.k	$SF(A)_Y = \dfrac{2g \times 5.850000}{\text{line m - line q}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \dfrac{[SF(A)_Y - 5.85] \times 10^6}{5.85}$	ppm
47.l	$SF(A)_Z = \dfrac{2g \times 5.850000}{\text{line g - line i}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \dfrac{[SF(A)_Z - 5.85] \times 10^6}{5.85}$	ppm
47.m	$A_{B_X} = \dfrac{\text{line b + line d}}{2}$	cm/sec^2
47.n	$A_{B_Y} = \dfrac{\text{line m + line q}}{2}$	cm/sec^2
47.o	$A_{B_Z} = \dfrac{\text{line i + line g}}{2}$	cm/sec^2

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 43

JDC NO. 12217
REV. M

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
47.a	B_{D_X}	meru	-15.0		+15.0			s
47.b	B_{D_Y}	meru	-15.0		+15.0			t
47.c	B_{D_Z}	meru	-15.0		+15.0			u
47.d	$ADSRA_X$	meru/g	-40.0		+40.0			v
47.e	$ADSRA_Y$	meru/g	-40.0		+40.0			w
47.f	$ADSRA_Z$	meru/g	-40.0		+40.0			x
47.g	$ADIA_X$	meru/g	-100		+100			y
47.h	$ADIA_Y$	meru/g	-100		+100			z
47.i	$ADIA_Z$	meru/g	-100		+100			aa
47.j	$\Delta SF(A)_X$	ppm	-1900		+1900			ab
47.k	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac
47.l	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad
47.m	A_{B_X}	cm/sec^2	-2.20		+2.20			ae
47.n	A_{B_Y}	cm/sec^2	-2.20		+2.20			af
47.o	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag

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JDC ITEM NO.	CALCULATIONS	
48.a	$BD_XD_1 = \lvert \text{line ah - line s} \rvert$	meru
	$BD_XD_2 = D_1 + \lvert \text{line ai - line ah} \rvert$	meru
	$BD_XD_3 = D_2 + \lvert \text{line aj - line ai} \rvert$	meru
48.b	$BD_YD_1 = \lvert \text{line as - line t} \rvert$	meru
	$BD_YD_2 = D_1 + \lvert \text{line at - line as} \rvert$	meru
	$BD_YD_3 = D_2 + \lvert \text{line au - line at} \rvert$	meru
48.c	$BD_ZD_1 = \lvert \text{line bb - line u} \rvert$	meru
	$BD_ZD_2 = D_1 + \lvert \text{line bc - line bb} \rvert$	meru
	$BD_ZD_3 = D_2 + \lvert \text{line bd - line bc} \rvert$	meru

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JDC ITEM NO.	CALCULATIONS	
48.d	$ADSRA_XD_1 = \lvert \text{line ak} - \text{line v} \rvert$	meru/g
	$ADSRA_XD_2 = D_1 + \lvert \text{line am} - \text{line ak} \rvert$	meru/g
	$ADSRA_XD_3 = D_2 + \lvert \text{line an} - \text{line am} \rvert$	meru/g
48.e	$ADSRA_YD_1 = \lvert \text{line av} - \text{line w} \rvert$	meru/g
	$ADSRA_YD_2 = D_1 + \lvert \text{line aw} - \text{line av} \rvert$	meru/g
	$ADSRA_YD_3 = D_2 + \lvert \text{line ax} - \text{line aw} \rvert$	meru/g
48.f	$ADSRA_ZD_1 = \lvert \text{line be} - \text{line x} \rvert$	meru/g
	$ADSRA_ZD_2 = D_1 + \lvert \text{line bf} - \text{line be} \rvert$	meru/g
	$ADSRA_ZD_3 = D_2 + \lvert \text{line bg} - \text{line bf} \rvert$	meru/g

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JDC ITEM NO.	CALCULATIONS	
48.g	$ADIA_XD_1 = \lvert \text{line ap} - \text{line y} \rvert$	meru/g
	$ADIA_XD_2 = D_1 + \lvert \text{line aq} - \text{line ap} \rvert$	meru/g
	$ADIA_XD_3 = D_2 + \lvert \text{line ar} - \text{line aq} \rvert$	meru/g
48.h	$ADIA_YD_1 = \lvert \text{line ay} - \text{line z} \rvert$	meru/g
	$ADIA_YD_2 = D_1 + \lvert \text{line az} - \text{line ay} \rvert$	meru/g
	$ADIA_YD_3 = D_2 + \lvert \text{line ba} - \text{line az} \rvert$	meru/g
48.i	$ADIA_ZD_1 = \lvert \text{line bh} - \text{line aa} \rvert$	meru/g
	$ADIA_ZD_2 = D_1 + \lvert \text{line bi} - \text{line bh} \rvert$	meru/g
	$ADIA_ZD_3 = D_2 + \lvert \text{line bj} - \text{line bi} \rvert$	meru/g

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JDC ITEM NO.	CALCULATIONS	
48.j	$\Delta\ SF(A)_XD_1 = \lvert \text{line bk} - \text{line ab} \rvert$	ppm
	$\Delta\ SF(A)_XD_2 = D_1 + \lvert \text{line bm} - \text{line bk} \rvert$	ppm
	$\Delta\ SF(A)_XD_3 = D_2 + \lvert \text{line bn} - \text{line bm} \rvert$	ppm
48.k	$\Delta\ SF(A)_YD_1 = \lvert \text{line bs} - \text{line ac} \rvert$	ppm
	$\Delta\ SF(A)_YD_2 = D_1 + \lvert \text{line bt} - \text{line bs} \rvert$	ppm
	$\Delta\ SF(A)_YD_3 = D_2 + \lvert \text{line bu} - \text{line bt} \rvert$	ppm
48.1	$\Delta\ SF(A)_ZD_1 = \lvert \text{line by} - \text{line ad} \rvert$	ppm
	$\Delta\ SF(A)_ZD_2 = D_1 + \lvert \text{line bz} - \text{line by} \rvert$	ppm
	$\Delta\ SF(A)_ZD_3 = D_2 + \lvert \text{line ca} - \text{line bz} \rvert$	ppm

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JDC ITEM NO.	CALCULATIONS	
48.m	$A_{B_X}\ D_1 = \lvert \text{line bp} - \text{line ae} \rvert$	cm/sec^2
	$A_{B_X}\ D_2 = D_1 + \lvert \text{line bq} - \text{line bp} \rvert$	cm/sec^2
	$A_{B_X}\ D_3 = D_2 + \lvert \text{line br} - \text{line bq} \rvert$	cm/sec^2
48.n	$A_{B_Y}\ D_1 = \lvert \text{line bv} - \text{line af} \rvert$	cm/sec^2
	$A_{B_Y}\ D_2 = D_1 + \lvert \text{line bw} - \text{line bv} \rvert$	cm/sec^2
	$A_{B_Y}\ D_3 = D_2 + \lvert \text{line bx} - \text{line bw} \rvert$	cm/sec^2
48.o	$A_{B_Z}\ D_1 = \lvert \text{line cb} - \text{line ag} \rvert$	cm/sec^2
	$A_{B_Z}\ D_2 = D_1 + \lvert \text{line cc} - \text{line cb} \rvert$	cm/sec^2
	$A_{B_Z}\ D_3 = D_2 + \lvert \text{line cd} - \text{line cc} \rvert$	cm/sec^2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.a	Initial BD_XD_1	meru	▨		6.0	▨	▨
	Initial BD_XD_2	meru	▨		9.0	▨	▨
	Initial BD_XD_3	meru	▨		11.0	▨	▨
48.a	Final BD_XD_1	meru	▨		6.0		
or	Final BD_XD_2	meru	▨		9.0		
54.a	Final BD_XD_3	meru	▨		11.0		
48.b	Initial BD_YD_1	meru	▨		6.0	▨	▨
	Initial BD_YD_2	meru	▨		9.0	▨	▨
	Initial BD_YD_3	meru	▨		11.0	▨	▨
48.b	Final BD_YD_1	meru	▨		6.0		
or	Final BD_YD_2	meru	▨		9.0		
54.b	Final BD_YD_3	meru	▨		11.0		
48.c	Initial BD_ZD_1	meru	▨		6.0	▨	▨
	Initial BD_ZD_2	meru	▨		9.0	▨	▨
	Initial BD_ZD_3	meru	▨		11.0	▨	▨
48.c	Final BD_ZD_1	meru	▨		6.0		
or	Final BD_ZD_2	meru	▨		9.0		
54.c	Final BD_ZD_3	meru	▨		11.0		

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.d	Initial $ADSRA_XD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_XD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_XD_3$	meru/g	▨		25.0	▨	▨
48.d	Final $ADSRA_XD_1$	meru/g	▨		14.0		
or	Final $ADSRA_XD_2$	meru/g	▨		21.0		
54.d	Final $ADSRA_XD_3$	meru/g	▨		25.0		
48.e	Initial $ADSRA_YD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_YD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_YD_3$	meru/g	▨		25.0	▨	▨
48.e	Final $ADSRA_YD_1$	meru/g	▨		14.0		
or	Final $ADSRA_YD_2$	meru/g	▨		21.0		
54.e	Final $ADSRA_YD_3$	meru/g	▨		25.0		
48.f	Initial $ADSRA_ZD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_ZD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_ZD_3$	meru/g	▨		25.0	▨	▨
48.f	Final $ADSRA_ZD_1$	meru/g	▨		14.0		
or	Final $ADSRA_ZD_2$	meru/g	▨		21.0		
54.f	Final $ADSRA_ZD_3$	meru/g	▨		25.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.g	Initial $ADIA_XD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_XD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_XD_3$	meru/g	▨		40.0	▨	▨
48.g	Final $ADIA_XD_1$	meru/g	▨		17.0		
or	Final $ADIA_XD_2$	meru/g	▨		33.0		
54.g	Final $ADIA_XD_3$	meru/g	▨		40.0		
48.h	Initial $ADIA_YD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_YD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_YD_3$	meru/g	▨		40.0	▨	▨
48.h	Final $ADIA_YD_1$	meru/g	▨		17.0		
or	Final $ADIA_YD_2$	meru/g	▨		33.0		
54.h	Final $ADIA_YD_3$	meru/g	▨		40.0		
48.i	Initial $ADIA_ZD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_ZD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_ZD_3$	meru/g	▨		40.0	▨	▨
48.i	Final $ADIA_ZD_1$	meru/g	▨		17.0		
or	Final $ADIA_ZD_2$	meru/g	▨		33.0		
54.i	Final $ADIA_ZD_3$	meru/g	▨		40.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.j	Initial $\Delta SF(A)_XD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_XD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_XD_3$	ppm	▨		600	▨	▨
48.j	Final $\Delta SF(A)_XD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_XD_2$	ppm	▨		500		
54.j	Final $\Delta SF(A)_XD_3$	ppm	▨		600		
48.k	Initial $\Delta SF(A)_YD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_YD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_YD_3$	ppm	▨		600	▨	▨
48.k	Final $\Delta SF(A)_YD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_YD_2$	ppm	▨		500		
54.k	Final $\Delta SF(A)_YD_3$	ppm	▨		600		
48.l	Initial $\Delta SF(A)_ZD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_ZD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_ZD_3$	ppm	▨		600	▨	▨
48.l	Final $\Delta SF(A)_ZD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_ZD_2$	ppm	▨		500		
54.l	Final $\Delta SF(A)_ZD_3$	ppm	▨		600		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.m	Initial $A_{B_X}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_X}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_X}D_3$	cm/sec^2	▨		0.90	▨	▨
48.m	Final $A_{B_X}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_X}D_2$	cm/sec^2	▨		0.70		
54.m	Final $A_{B_X}D_3$	cm/sec^2	▨		0.90		
48.n	Initial $A_{B_Y}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_Y}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_Y}D_3$	cm/sec^2	▨		0.90	▨	▨
48.n	Final $A_{B_Y}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_Y}D_2$	cm/sec^2	▨		0.70		
54.n	Final $A_{B_Y}D_3$	cm/sec^2	▨		0.90		
48.o	Initial $A_{B_Z}D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_Z}D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_Z}D_3$	cm/sec^2	▨		0.90	▨	▨

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.o	Final $A_{B_Z}D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_Z}D_2$	cm/sec^2	▨		0.70		
54.o	Final $A_{B_Z}D_3$	cm/sec^2	▨		0.90		
50 (1)	Gyro WHEEL	Time	▨		▨	▨	▨
50 (2.a)	X PIPA G/S output	Volts p-p	▨		15		
50 (2.b)	Y PIPA G/S output	Volts p-p	▨		15		
50 (2.c)	Z PIPA G/S output	Volts p-p	▨		15		
50 (6.f.1)	X PIPA PVR	Volts dc	5.94		6.06		
50 (6.f.2)	Y PIPA PVR	Volts dc	5.94		6.06		
50 (6.f.3)	Z PIPA PVR	Volts dc	5.94		6.06		
50 (11)	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (17)	+BDY (ROW 2 indication) Position +00001	meru	▨	( ) ___.__	▨	▨	▨	a.1
50 (18)	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	b.1
50 (21)	+BDZ (ROW 2 indication) Position +00002	meru	▨	( ) ___.__	▨	▨	▨	c.1
50 (22)	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	d.1
50 (23)	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( ) ___.__	▨	▨	▨	e.1
50 (23A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (23A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (26)	-BDX (ROW 2 indication) Position +00003	meru	▨	( ) ___.__	▨	▨	▨	f.1
50 (27)	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	g.1

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (30)	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( ) ___.__	▨	▨	▨	h.1
50 (31)	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	i.1
50 (32)	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( ) ___.__	▨	▨	▨	j.1
50 (32A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (32A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (36)	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( ) ___.__	▨	▨	▨	k.1
50 (37)	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2	▨	( ) _____. ( ) _____	▨	▨	▨	m.1
50 (40)	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( ) ___.__	▨	▨	▨	n.1
50 (41)	-BDZ - ADSRAZ = (line k.1) -2 (line c.1) =	meru	▨	( ) ___.__	▨	▨	▨	p.1

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (42)	-Y PIPA Test (ROW 1 indication) Position + 00006 (ROW 2 indication)	cm/sec^2		( ) _____. ( ) _____.				q.1
50 (43.f)	Time of ENTR	Time		__hrs__min__sec				
50 (43.g)	ROW 1 indication	deg		( ) ___.__				
	ROW 2 indication	deg		( ) ___.__				
	ROW 3 indication	deg		( ) ___.__				
50 (43.i)	Time of ENTR	Time		__hrs__min__sec				
50 (43.j)	ROW 1 indication	deg		( ) ___.__				
	ROW 2 indication	deg		( ) ___.__				
	ROW 3 indication	deg		( ) ___.__				
50 (43.m)	-BDY + ADIAY (ROW 2 indication) Position +00006	meru		( ) ___.__				r.1

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JDC ITEM NO.	CALCULATIONS	
50 (47.a)	$BD_X = -$ (line f.1) = ( )	meru
50 (47.b)	$BD_Y =$ line a.1 = ( )	meru
50 (47.c)	$BD_Z =$ line c.1 = ( )	meru
50 (47.d)	$ADSRA_X =$ line n.1 + line f.1 = ( )	meru/g
50 (47.e)	$ADSRA_Y =$ line h.1 - line a.1 = ( )	meru/g

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JDC ITEM NO.	CALCULATIONS	
50 (47.f)	$ADSRA_Z = -$ (line k.1) + line c.1 = ( )	meru/g
50 (47.g)	$ADIA_X = -1 \left[(\text{line e.1}) + (\text{line f.1}) \right] = (\ )$	meru/g
50 (47.h)	$ADIA_Y =$ line r.1 + line a.1 = ( )	meru/g
50 (47.i)	$ADIA_Z =$ line j.1 - line c.1 = ( )	meru/g
50 (47.j)	g = ___.__ (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \frac{2g \times 5.850000}{\text{line b.1 - line d.1}}$	cm/sec/pulse
	$\Delta SF(A)_X = \frac{\left[SF(A)_X - 5.85\right] \times 10^6}{5.85}$	ppm

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JDC ITEM NO.	CALCULATIONS	
50 (47.k)	$SF(A)_Y = \frac{2g \times 5.850000}{\text{line m.1 - line q.1}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \frac{\left[SF(A)_Y - 5.85\right] \times 10^6}{5.85}$	ppm
50 (47.l)	$SF(A)_Z = \frac{2g \times 5.850000}{\text{line g.1 - line i.1}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \frac{\left[SF(A)_Z - 5.85\right] \times 10^6}{5.85}$	ppm
50 (47.m)	$A_{B_X} = \frac{\text{line b.1 + line d.1}}{2}$	cm/sec^2
50 (47.n)	$A_{B_Y} = \frac{\text{line m.1 + line q.1}}{2}$	cm/sec^2
50 (47.o)	$A_{B_Z} = \frac{\text{line i.1 + line g.1}}{2}$	cm/sec^2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (47.a)	B_{D_X}	meru	-15.0		+15.0			s.1
50 (47.b)	B_{D_Y}	meru	-15.0		+15.0			t.1
50 (47.c)	B_{D_Z}	meru	-15.0		+15.0			u.1
50 (47.d)	ADSRA$_X$	meru/g	-40.0		+40.0			v.1
50 (47.e)	ADSRA$_Y$	meru/g	-40.0		+40.0			w.1
50 (47.f)	ADSRA$_Z$	meru/g	-40.0		+40.0			x.1
50 (47.g)	ADIA$_X$	meru/g	-100		+100			y.1
50 (47.h)	ADIA$_Y$	meru	-100		+100			z.1
50 (47.i)	ADIA$_Z$	meru/g	-100		+100			aa.1
50 (47.j)	ΔSF(A)$_X$	ppm	-1900		+1900			ab.1
50 (47.k)	ΔSF(A)$_Y$	ppm	-1900		+1900			ac.1
50 (47.l)	ΔSF(A)$_Z$	ppm	-1900		+1900			ad.1

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (47.m)	A_{B_X}	cm/sec^2	-2.20		+2.20			ae.1
50 (47.n)	A_{B_Y}	cm/sec^2	-2.20		+2.20			af.1
50 (47.o)	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag.1
53 (1)	Gyro WHEEL	Time	▨		▨	▨	▨	
53 (2.a)	X PIPA G/S output	Volts p-p	▨		15			
53 (2.b)	Y PIPA G/S output	Volts p-p	▨		15			
53 (2.c)	Z PIPA G/S output	Volts p-p	▨		15			
53 (6.f.1)	X PIPA PVR	Volts dc	5.94		6.06			
53 (6.f.2)	Y PIPA PVR	Volts dc	5.94		6.06			
53 (6.f.3)	Z PIPA PVR	Volts dc	5.94		6.06			
53 (11)	X PIPA TCM	Volts dc	0.98		1.08			
	Y PIPA TCM	Volts dc	0.98		1.08			

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (11) (cont)	Z PIPA TCM	Volts dc	0.98		1.08			
53 (17)	+BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a.2
53 (18)	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	b.2
53 (21)	+BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c.2
53 (22)	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	d.2
53 (23)	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e.2
53 (23A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (23A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (26)	-BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f.2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (27)	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	g.2
53 (30)	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	h.2
53 (31)	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	i.2
53 (32)	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	j.2
53 (32A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (32A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (36)	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.__	▨	▨	▨	k.2
53 (37)	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	m.2
53 (40)	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	n.2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (41)	-BDZ - ADSRAZ = (line k.2) -2 (line c.2) =	meru	▨	( )___.__	▨	▨	▨	p.2
53 (42)	-Y PIPA Test (ROW 1 indication) Position +00006 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	q.2
53 (43.f)	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
53 (43.g)	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
53 (43.i)	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
53 (43.j)	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
53 (43.m)	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	r.2

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JDC ITEM NO.	CALCULATIONS	
53 (47.a)	$BD_X = -$ (line f.2) = ( )	meru
53 (47.b)	$BD_Y =$ line a.2 = ( )	meru
53 (47.c)	$BD_Z =$ line c.2 = ( )	meru
53 (47.d)	$ADSRA_X =$ line n.2 + line f.2 = ( )	meru/g

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JDC ITEM NO.	CALCULATIONS	
53 (47.e)	$ADSRA_Y =$ line h.2 - line a.2 = ( )	meru/g
53 (47.f)	$ADSRA_Z = -$ (line k.2) + line c.2 = ( )	meru/g
53 (47.g)	$ADIA_X = -1 \left[-\text{(line e.2)} + \text{(line f.2)} \right] = (\ )$	meru/g
53 (47.h)	$ADIA_Y =$ line r.2 + line a.2 = ( )	meru/g
53 (47.i)	$ADIA_Z =$ line j.2 - line c.2 = ( )	meru/g
53 (47.j)	g = ___.__ (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \dfrac{2g \times 5.850000}{\text{line b.2 - line d.2}}$	cm/sec/pulse
	$\Delta SF(A)_X = \dfrac{\left[SF(A)_X - 5.85\right] \times 10^6}{5.85}$	ppm

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JDC ITEM NO.	CALCULATIONS	
53 (47.k)	$SF(A)_Y = \dfrac{2g \times 5.850000}{\text{line m.2 - line q.2}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \dfrac{\left[SF(A)_Y - 5.85\right] \times 10^6}{5.85}$	ppm
53 (47.l)	$SF(A)_Z = \dfrac{2g \times 5.850000}{\text{line g.2 - line i.2}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \dfrac{\left[SF(A)_Z - 5.85\right] \times 10^6}{5.85}$	ppm
53 (47.m)	$A_{B_X} = \dfrac{\text{line b.2 + line d.2}}{2}$	cm/sec^2
53 (47.n)	$A_{B_Y} = \dfrac{\text{line m.2 + line q.2}}{2}$	cm/sec^2
53 (47.o)	$A_{B_Z} = \dfrac{\text{line i.2 + line g.2}}{2}$	cm/sec^2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (47.a)	B_{D_X}	meru	-15.0		+15.0			s.2
53 (47.b)	B_{D_Y}	meru	-15.0		+15.0			t.2
53 (47.c)	B_{D_Z}	meru	-15.0		+15.0			u.2
53 (47.d)	$ADSRA_X$	meru/g	-40.0		+40.0			v.2
53 (47.e)	$ADSRA_Y$	meru/g	-40.0		+40.0			w.2
53 (47.f)	$ADSRA_Z$	meru/g	-40.0		+40.0			x.2
53 (47.g)	$ADIA_X$	meru/g	-100		+100			y.2
53 (47.h)	$ADIA_Y$	meru/g	-100		+100			z.2
53 (47.i)	$ADIA_Z$	meru/g	-100		+100			aa.2
53 (47.j)	$\Delta SF(A)_X$	ppm	-1900		+1900			ab.2
53 (47.k)	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac.2
53 (47.l)	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad.2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (47.m)	A_{B_X}	cm/sec^2	-2.20		+2.20			ae.2
53 (47.n)	A_{B_Y}	cm/sec^2	-2.20		+2.20			af.2
53 (47.o)	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag.2

JDC ITEM NO.	CALCULATIONS	
54.a	$BD_XD_1 = \lvert \text{line s.1 - line s.2} \rvert$	meru
	$BD_XD_2 = D_1 + \lvert \text{line s - line s.1} \rvert$	meru
	$BD_XD_3 = D_2 + \lvert \text{line ah - line s} \rvert$	meru
54.b	$BD_YD_1 = \lvert \text{line t.1 - line t.2} \rvert$	meru
	$BD_YD_2 = D_1 + \lvert \text{line t - line t.1} \rvert$	meru
	$BD_YD_3 = D_2 + \lvert \text{line as - line t} \rvert$	meru

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JDC ITEM NO.	CALCULATIONS	
54.c	$BD_ZD_1 = \lvert \text{line u.1 - line u.2} \rvert$	meru
	$BD_ZD_2 = D_1 + \lvert \text{line u - line u.1} \rvert$	meru
	$BD_ZD_3 = D_2 + \lvert \text{line bb - line u} \rvert$	meru
54.d	$ADSRA_XD_1 = \lvert \text{line v.1 - line v.2} \rvert$	meru/g
	$ADSRA_XD_2 = D_1 + \lvert \text{line v - line v.1} \rvert$	meru/g
	$ADSRA_XD_3 = D_2 + \lvert \text{line ak - line v} \rvert$	meru/g
54.e	$ADSRA_YD_1 = \lvert \text{line w.1 - line w.2} \rvert$	meru/g
	$ADSRA_YD_2 = D_1 + \lvert \text{line w - line w.1} \rvert$	meru/g
	$ADSRA_YD_3 = D_2 + \lvert \text{line av - line w} \rvert$	meru/g

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JDC ITEM NO.	CALCULATIONS	
54.f	$ADSRA_ZD_1 = \lvert \text{line x.1 - line x.2} \rvert$	meru/g
	$ADSRA_ZD_2 = D_1 + \lvert \text{line x - line x.1} \rvert$	meru/g
	$ADSRA_ZD_3 = D_2 + \lvert \text{line be - line x} \rvert$	meru/g
54.g	$ADIA_XD_1 = \lvert \text{line y.1 - line y.2} \rvert$	meru/g
	$ADIA_XD_2 = D_1 + \lvert \text{line y - line y.1} \rvert$	meru/g
	$ADIA_XD_3 = D_2 + \lvert \text{line ap - line y} \rvert$	meru/g
54.h	$ADIA_YD_1 = \lvert \text{line z.1 - line z.2} \rvert$	meru/g
	$ADIA_YD_2 = D_1 + \lvert \text{line z - line z.1} \rvert$	meru/g
	$ADIA_YD_3 = D_2 + \lvert \text{line ay - line z} \rvert$	meru/g

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JDC ITEM NO.	CALCULATIONS	
54.i	$ADIA_Z D_1 = \lvert \text{line aa.1} - \text{line aa.2} \rvert$	meru/g
	$ADIA_Z D_2 = D_1 + \lvert \text{line aa} - \text{line aa.1} \rvert$	meru/g
	$ADIA_Z D_3 = D_2 + \lvert \text{line bh} - \text{line aa} \rvert$	meru/g
54.j	$\Delta SF(A)_X D_1 = \lvert \text{line ab.1} - \text{line ab.2} \rvert$	ppm
	$\Delta SF(A)_X D_2 = D_1 + \lvert \text{line ab} - \text{line ab.1} \rvert$	ppm
	$\Delta SF(A)_X D_3 = D_2 + \lvert \text{line bk} - \text{line ab} \rvert$	ppm
54.k	$\Delta SF(A)_Y D_1 = \lvert \text{line ac.1} - \text{line ac.2} \rvert$	ppm
	$\Delta SF(A)_Y D_2 = D_1 + \lvert \text{line ac} - \text{line ac.1} \rvert$	ppm
	$\Delta SF(A)_Y D_3 = D_2 + \lvert \text{line bs} - \text{line ac} \rvert$	ppm

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JDC ITEM NO.	CALCULATIONS	
54.l	$\Delta SF(A)_Z D_1 = \lvert \text{line ad.1} - \text{line ad.2} \rvert$	ppm
	$\Delta SF(A)_Z D_2 = D_1 + \lvert \text{line ad} - \text{line ad.1} \rvert$	ppm
	$\Delta SF(A)_Z D_3 = D_2 + \lvert \text{line by} - \text{line ad} \rvert$	ppm
54.m	$A_{B_X} D_1 = \lvert \text{line ae.1} - \text{line ae.2} \rvert$	cm/sec^2
	$A_{B_X} D_2 = D_1 + \lvert \text{line ae} - \text{line ae.1} \rvert$	cm/sec^2
	$A_{B_X} D_3 = D_2 + \lvert \text{line bp} - \text{line ae} \rvert$	cm/sec^2
54.n	$A_{B_Y} D_1 = \lvert \text{line af.1} - \text{line af.2} \rvert$	cm/sec^2
	$A_{B_Y} D_2 = D_1 + \lvert \text{line af} - \text{line af.1} \rvert$	cm/sec^2
	$A_{B_Y} D_3 = D_2 + \lvert \text{line bv} - \text{line af} \rvert$	cm/sec^2

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JDC ITEM NO.	CALCULATIONS	
54.o	$A_{B_Z} D_1 = \lvert \text{line ag.1} - \text{line ag.2} \rvert$	cm/sec^2
	$A_{B_Z} D_2 = D_1 + \lvert \text{line ag} - \text{line ag.1} \rvert$	cm/sec^2
	$A_{B_Z} D_3 = D_2 + \lvert \text{line cb} - \text{line ag} \rvert$	cm/sec^2

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4.

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TEST	COEFFICIENT	VALUE	TEST DATE	
IRIG I & A JDC 16236 JDC 12217 Spacecraft	(EXAMPLE) Last Historical BD_X	+1.46	3/8/67	
	(EXAMPLE) Second Last Historical BD_X	+1.09	2/15/67	
	(EXAMPLE) Third Last Historical BD_X	-0.29	1/24/67	
IRIG I & A JDC 16236 JDC 12217 Spacecraft	Last Historical BD_X			ah
	Second Last Historical BD_X			ai
	Third Last Historical BD_X			aj
IRIG I & A JDC 16236 JDC 12217 Spacecraft	Last Historical $ADSRA_X$			ak
	Second Last Historical $ADSRA_X$			am
	Third Last Historical $ADSRA_X$			an
IRIG I & A JDC 16237 JDC 12217 Spacecraft	Last Historical $ADIA_X$			ap
	Second Last Historical $ADIA_X$			aq
	Third Last Historical $ADIA_X$			ar
IRIG I & A JDC 16239 JDC 12217 Spacecraft	Last Historical BD_Y			as
	Second Last Historical BD_Y			at
	Third Last Historical BD_Y			au

Table 5

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TEST	COEFFICIENT	VALUE	TEST DATE	
IRIG I & A JDC 16239 JDC 12217 Spacecraft	Last Historical $ADSRA_Y$			av
	Second Last Historical $ADSRA_Y$			aw
	Third Last Historical $ADSRA_Y$			ax
IRIG I & A JDC 16240 JDC 12217 Spacecraft	Last Historical $ADIA_Y$			ay
	Second Last Historical $ADIA_Y$			az
	Third Last Historical $ADIA_Y$			ba
IRIG I & A JDC 16242 JDC 12217 Spacecraft	Last Historical BD_Z			bb
	Second Last Historical BD_Z			bc
	Third Last Historical BD_Z			bd
IRIG I & A JDC 16242 JDC 12217 Spacecraft	Last Historical $ADSRA_Z$			be
	Second Last Historical $ADSRA_Z$.			bf
	Third Last Historical $ADSRA_Z$			bg
IRIG I & A JDC 16243 JDC 12217 Spacecraft	Last Historical $ADIA_Z$			bh
	Second Last Historical $ADIA_Z$			bi
	Third Last Historical $ADIA_Z$			bj
JDC 14155 JDC 14201 JDC 12217 Spacecraft	Last Historical $\Delta SF(A)_X$			bk
	Second Last Historical $\Delta SF(A)_X$			bm
	Third Last Historical $\Delta SF(A)_X$			bn

Table 5 (cont)

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JDC		VALUE	TEST DATE	
JDC 14155 JDC 14201 JDC 12217 Spacecraft	Last Historical A_{B_X}			bp
	Second Last Historical A_{B_X}			bq
	Third Last Historical A_{B_X}			br
JDC 14156 JDC 14203 JDC 12217 Spacecraft	Last Historical $\Delta SF(A)_Y$			bs
	Second Last Historical $\Delta SF(A)_Y$			bt
	Third Last Historical $\Delta SF(A)_Y$			bu
JDC 14156 JDC 14203 JDC 12217 Spacecraft	Last Historical A_{B_Y}			bv
	Second Last Historical A_{B_Y}			bw
	Third Last Historical A_{B_Y}			bx
JDC 14157 JDC 14205 JDC 12217 Spacecraft	Last Historical $\Delta SF(A)_Z$			by
	Second Last Historical $\Delta SF(A)_Z$			bz
	Third Last Historical $\Delta SF(A)_Z$			ca
JDC 14157 JDC 14205 JDC 12217 Spacecraft	Last Historical A_{B_Z}			cb
	Second Last Historical A_{B_Z}			cc
	Third Last Historical A_{B_Z}			cd

Table 5 (cont)

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COEFFICIENT	JDC STEPS TO BE PREPARED																																					PARAMETERS TO BE CALCULATED	ENG. APPROVAL
	1→14	15	16	17	18	19	20	21	Ⓐ	22	22A	23	23A	24	25	26	27	28	29	30	31	31A	32	32A	33	34	35	36	37	38	39	40	41	42	42A	43	44→47		
BD_X	X														X	X																					X	BD_X	
BD_Y	X	X	X	X																																	X	BD_Y	
BD_Z	X						X	X																													X	BD_Z	
$ADSRA_X$	X														X	X											X			X	X	X					X	$ADSRA_X$ and BD_X	
$ADSRA_Y$	X	X	X	X														X	X	X																	X	$ADSRA_Y$ and BD_Y	
$ADSRA_Z$	X						X	X	X																	X	X	X									X	$ADSRA_Z$ and BD_Z	
$ADIA_X$	X	X	X	X		X	X	X		X	X	X	X	X	X	X																					X	$ADIA_X$, BD_X, BD_Y, and BD_Z	
$ADIA_Y$	X	X	X	X		X	X	X	X																	X	X	X		X	X	X	X	X	X	X	X	$ADIA_Y$, BD_Y, $ADSRA_Z$, and BD_Z	
$ADIA_Z$	X						X	X	X						X	X		X	X	X	X	X	X	X													X	$ADIA_Z$, BD_Z, and BD_X	
AB_X or $\Delta SF(A)_X$	X	X	X	X	X	X	X	X		X																											X	AB_X, $\Delta SF(A)_X$, BD_Y, and BD_Z	
AB_Y or $\Delta SF(A)_Y$	X																									X	X	X	X	X	X	X		X			X	AB_Y and $\Delta SF(A)_Y$	
AB_Z or $\Delta SF(A)_Z$	X														X	X	X	X	X	X	X																X	AB_Z, $\Delta SF(A)_Z$, and BD_X	

Ⓐ Perform the following DSKY Operation:

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Table 6

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INITIAL TDRR 29882 D.S. PGS 43

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The three IRIG coefficient terms, BD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-4-66	30389	-	7,8	EA	-
B	9-15-66	31051	-	5,8	EA	-
C	10-20-66	31614	1	-	EA	-
D	10-27-66	31726	6	-	EA	-
E	11-3-66	31779	4-6	2-6	EA	-
F	11-15-66	31938	-	1	EA	-
G	11-17-66	31932	3	-	EA	-
H	1-5-67	32494	1,2,5,6	1	EA	-
J	3-23-67	33377	All	All	EA	-
K	6-6-67	33909	2,4,5,6,7	2-4,19-21, 26-28	EA	-
L	7-21-67	34204	1,5,7,8	40,41,42,43	SB	-
M	10-26-67	34931	1,8	3,43	EA	-
N	2-2-68	35555	1,4,5,7	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Fill in Table 5. Record most recent historical values (up to three values) and test dates for coefficient terms BD, ADSRA, ADIA, ΔSF (A) and A_B from IRIG Inspection and Acceptance Data (last retest average value), ISS testing, prior runs of this JDC, or prior spacecraft testing.

2. Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not initialize a test position if less than 90 minutes remain before time of overflow.

3. In some steps the DSKY data entries required when the CMC contains Computer Program Assembly 2021104-061 are different from the DSKY data entries required when the CMC contains Computer Program Assembly 2021104-031, -041, or -051. These differences are noted within the procedures.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the Dual Beam Oscilloscope by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEASURE

5. Adjust the VOLTAGE ratio transformer on the Current Source Monitor panel to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current

Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Set the PIP and IRIG S. F. MONITOR switch to OFF and perform the following DSKY operations:

VERB 37 ENTR
00001 ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3). If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+18000 ENTR
To correct ROW 2 -
VERB 22 ENTR
Test site latitude from Table 3 ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR

+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00001 ENTR

+BDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00002 ENTR

+BDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

NOTE: The entries shown in parentheses apply to Computer Program Assembly 2021104-061.

22A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00407 (02502) ENTR
c. 77757 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00411 (02504) ENTR
f. 00020 ENTR

-BDX + ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

23A. Perform the following DSKY operations:

a. VERB 06 NOUN 03 ENTR
b. 02530 ENTR
c. Record ROW 1 indication.
d. ENTR

e. 02531 ENTR
f. Record ROW 1 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR

To correct ROW 3 -
VERB 23 ENTR
+00003 ENTR

-BDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S. F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00000 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00004 ENTR

+BDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Z PIPA S. F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

NOTE: The entries shown in parentheses apply to Computer Program Assembly 2021104-061.

31A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00405 (02500) ENTR
c. 00020 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00407 (02502) ENTR
f. 77757 ENTR

+BDZ + ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

32A. Perform the following DSKY operations:

a. VERB 06 NOUN 03 ENTR
b. 02530 ENTR
c. Record ROW 1 indication.
d. ENTR
e. 02531 ENTR
f. Record ROW 1 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

+BDZ - ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 39.

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39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
+00037 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+BDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-BDY + ADIAY

41. Calculate -BDZ - ADSRAZ as shown on data sheet.

-Y PIPA S. F. TEST

42. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

NOTE: The entries shown in parentheses apply to Computer Program Assembly 2021104-061.

42A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00405 (02500) ENTR
c. 77757 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00411 (02504) ENTR
f. 00020 ENTR

NOTE: Read and understand step 43 before proceeding.

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 02637 ENTR
d. Enter the calculated value of -BDZ -ADSRAZ into the DSKY as ±XXX.XX and press the ENTR pushbutton.
e. VERB 06 NOUN 20 ENTR
f. Record exact time of pressing ENTR in e above.
g. Record ROW 1, ROW 2, and ROW 3 indications.
h. One hour after pressing ENTR in e above, press ENTR again.
i. Record exact time of pressing ENTR in h above.
j. Record ROW 1, ROW 2, and ROW 3 indications.
k. If KEY REL indicator on DSKY flashes press KEY REL pushbutton.
l. Observe
VERB 06 NOUN 66 Flashing
m. Record ROW 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

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46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Calculate coefficient terms BD, ADSRA, ADIA, ΔSF(A), and A_B. Record results.

48. Calculate coefficient stability terms D_1, D_2, and D_3 for each coefficient and record results as the initial values. (A total of four coefficient values are required in order to calculate a D_3 term.) If all stability term values are within the maximums given, record the results as the final values and proceed to the next step. If any stability term value exceeds the maximum given, retest the IMU by performing the retest sequence given in steps 50 through 55.

49. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

RETEST SEQUENCE

NOTE: 1. The following steps are to be performed only if the stability values calculated in step 48 exceed maximum values on the initial run.

2. When prior engineering approval is obtained, a partial retest sequence may be performed which will repeat only those steps associated with the coefficient stability values that exceed the maximums. In this event the engineering approval should be shown in Table 6 and a copy of Table 6 attached to the completed data sheets.

50. Repeat steps 1 through 47 or, if engineering approval has been obtained for a partial retest sequence, repeat the steps and calculate the parameters specified in Table 6 for the coefficient that exceeded stability value maximums. Record results on data sheet spaces provided.

51. Perform JDC 12204 to downmode system to ISS Standby.

52. Perform JDC 12204 to advance system to ISS Operate.

53. Repeat steps 1 through 47 or, if a partial retest sequence is being performed, repeat the steps and calculate the parameters specified in Table 6.

54. Calculate coefficient stability terms D_1, D_2, and D_3 for each coefficient and record results as the final values.

55. Return to step 49.

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DATA SHEET 1 OF 43

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JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ____	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨	▨	▨
2.a	X PIPA G/S output	Volts p-p	▨		15		
2.b	Y PIPA G/S output	Volts p-p	▨		15		
2.c	Z PIPA G/S output	Volts p-p	▨		15		
6.L.1	X PIPA PVR	Volts dc	5.94		6.06		
6.L.2	Y PIPA PVR	Volts dc	5.94		6.06		
6.L.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	b
21	+BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	d
23	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e
23A.c	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
23A.f	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
26	-BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	g

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	i
32	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	j
32A.c	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
32A.f	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
36	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.__	▨	▨	▨	k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	m
40	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	n
41	-BDZ - ADSRAZ = (line k) -2 (line c)	meru	▨	( )___.__	▨	▨	▨	p

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	-Y PIPA Test (ROW 1 indication) Position +00006 (ROW 2 indication)	cm/sec²	▨	( )_____. ( )_____	▨	▨	▨	q
43.f	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
43.g	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
43.i	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
43.j	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
43.m	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	r

JDC ITEM NO.	CALCULATIONS	
47.a	BD_X = - (line f) = ( )	meru
47.b	BD_Y = line a = ( )	meru

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JDC ITEM NO.	CALCULATIONS	
47.c	BD_Z = line c = ( )	meru
47.d	$ADSRA_X$ = line n + line f = ( )	meru/g
47.e	$ADSRA_Y$ = line h - line a = ( )	meru/g
47.f	$ADSRA_Z$ = - (line k) + line c = ( )	meru/g
47.g	$ADIA_X$ = -1 [-(line e) + (line f)] = ( )	meru/g
47.h	$ADIA_Y$ = line r + line a = ( )	meru/g
47.i	$ADIA_Z$ = line j - line c = ( )	meru/g
47.j	g = ___.__ (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \frac{2g \times 5.850000}{\text{line b} - \text{line d}}$	cm/sec/pulse
	$\Delta SF(A)_X = \frac{[SF(A)_X - 5.85] \times 10^6}{5.85}$	ppm

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JDC ITEM NO.	CALCULATIONS	
47.k	$SF(A)_Y = \frac{2g \times 5.850000}{\text{line m} - \text{line q}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \frac{[SF(A)_Y - 5.85] \times 10^6}{5.85}$	ppm
47.l	$SF(A)_Z = \frac{2g \times 5.850000}{\text{line g} - \text{line i}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \frac{[SF(A)_Z - 5.85] \times 10^6}{5.85}$	ppm
47.m	$A_{B_X} = \frac{\text{line b} + \text{line d}}{2}$	cm/sec^2
47.n	$A_{B_Y} = \frac{\text{line m} + \text{line q}}{2}$	cm/sec^2
47.o	$A_{B_Z} = \frac{\text{line i} + \text{line g}}{2}$	cm/sec^2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	AC	
47.a	B_{D_X}	meru	-15.0		+15.0			s
47.b	B_{D_Y}	meru	-15.0		+15.0			t
47.c	B_{D_Z}	meru	-15.0		+15.0			u
47.d	$ADSRA_X$	meru/g	-40.0		+40.0			v
47.e	$ADSRA_Y$	meru/g	-40.0		+40.0			w
47.f	$ADSRA_Z$	meru/g	-40.0		+40.0			x
47.g	$ADIA_X$	meru/g	-100		+100			y
47.h	$ADIA_Y$	meru/g	-100		+100			z
47.i	$ADIA_Z$	meru/g	-100		+100			aa
47.j	$\Delta SF(A)_X$	ppm	-1900		+1900			ab
47.k	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac
47.l	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad
47.m	A_{B_X}	cm/sec^2	-2.20		+2.20			ae
47.n	A_{B_Y}	cm/sec^2	-2.20		+2.20			af
47.o	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag

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JDC ITEM NO.	CALCULATIONS	
48.a	$BD_XD_1 = \lvert \text{line ah} - \text{line s} \rvert$	meru
	$BD_XD_2 = D_1 + \lvert \text{line ai} - \text{line ah} \rvert$	meru
	$BD_XD_3 = D_2 + \lvert \text{line aj} - \text{line ai} \rvert$	meru
48.b	$BD_YD_1 = \lvert \text{line as} - \text{line t} \rvert$	meru
	$BD_YD_2 = D_1 + \lvert \text{line at} - \text{line as} \rvert$	meru
	$BD_YD_3 = D_2 + \lvert \text{line au} - \text{line at} \rvert$	meru
48.c	$BD_ZD_1 = \lvert \text{line bb} - \text{line u} \rvert$	meru
	$BD_ZD_2 = D_1 + \lvert \text{line bc} - \text{line bb} \rvert$	meru
	$BD_ZD_3 = D_2 + \lvert \text{line bd} - \text{line bc} \rvert$	meru

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JDC ITEM NO.	CALCULATIONS	
48.d	$ADSRA_X D_1 = \lvert \text{line ak} - \text{line v} \rvert$	meru/g
	$ADSRA_X D_2 = D_1 + \lvert \text{line am} - \text{line ak} \rvert$	meru/g
	$ADSRA_X D_3 = D_2 + \lvert \text{line an} - \text{line am} \rvert$	meru/g
48.e	$ADSRA_Y D_1 = \lvert \text{line av} - \text{line w} \rvert$	meru/g
	$ADSRA_Y D_2 = D_1 + \lvert \text{line aw} - \text{line av} \rvert$	meru/g
	$ADSRA_Y D_3 = D_2 + \lvert \text{line ax} - \text{line aw} \rvert$	meru/g
48.f	$ADSRA_Z D_1 = \lvert \text{line be} - \text{line x} \rvert$	meru/g
	$ADSRA_Z D_2 = D_1 + \lvert \text{line bf} - \text{line be} \rvert$	meru/g
	$ADSRA_Z D_3 = D_2 + \lvert \text{line bg} - \text{line bf} \rvert$	meru/g

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JDC ITEM NO.	CALCULATIONS	
48.g	$ADIA_X D_1 = \lvert \text{line ap} - \text{line y} \rvert$	meru/g
	$ADIA_X D_2 = D_1 + \lvert \text{line aq} - \text{line ap} \rvert$	meru/g
	$ADIA_X D_3 = D_2 + \lvert \text{line ar} - \text{line aq} \rvert$	meru/g
48.h	$ADIA_Y D_1 = \lvert \text{line ay} - \text{line z} \rvert$	meru/g
	$ADIA_Y D_2 = D_1 + \lvert \text{line az} - \text{line ay} \rvert$	meru/g
	$ADIA_Y D_3 = D_2 + \lvert \text{line ba} - \text{line az} \rvert$	meru/g
48.i	$ADIA_Z D_1 = \lvert \text{line bh} - \text{line aa} \rvert$	meru/g
	$ADIA_Z D_2 = D_1 + \lvert \text{line bi} - \text{line bh} \rvert$	meru/g
	$ADIA_Z D_3 = D_2 + \lvert \text{line bj} - \text{line bi} \rvert$	meru/g

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JDC ITEM NO.	CALCULATIONS	
48.j	$\Delta\ SF(A)_X D_1 = \lvert \text{line bk} - \text{line ab} \rvert$	ppm
	$\Delta\ SF(A)_X D_2 = D_1 + \lvert \text{line bm} - \text{line bk} \rvert$	ppm
	$\Delta\ SF(A)_X D_3 = D_2 + \lvert \text{line bn} - \text{line bm} \rvert$	ppm
48.k	$\Delta\ SF(A)_Y D_1 = \lvert \text{line bs} - \text{line ac} \rvert$	ppm
	$\Delta\ SF(A)_Y D_2 = D_1 + \lvert \text{line bt} - \text{line bs} \rvert$	ppm
	$\Delta\ SF(A)_Y D_3 = D_2 + \lvert \text{line bu} - \text{line bt} \rvert$	ppm
48.1	$\Delta\ SF(A)_Z D_1 = \lvert \text{line by} - \text{line ad} \rvert$	ppm
	$\Delta\ SF(A)_Z D_2 = D_1 + \lvert \text{line bz} - \text{line by} \rvert$	ppm
	$\Delta\ SF(A)_Z D_3 = D_2 + \lvert \text{line ca} - \text{line bz} \rvert$	ppm

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JDC ITEM NO.	CALCULATIONS	
48.m	$A_{B_X} D_1 = \lvert \text{line bp} - \text{line ae} \rvert$	cm/sec^2
	$A_{B_X} D_2 = D_1 + \lvert \text{line bq} - \text{line bp} \rvert$	cm/sec^2
	$A_{B_X} D_3 = D_2 + \lvert \text{line br} - \text{line bq} \rvert$	cm/sec^2
48.n	$A_{B_Y} D_1 = \lvert \text{line bv} - \text{line af} \rvert$	cm/sec^2
	$A_{B_Y} D_2 = D_1 + \lvert \text{line bw} - \text{line bv} \rvert$	cm/sec^2
	$A_{B_Y} D_3 = D_2 + \lvert \text{line bx} - \text{line bw} \rvert$	cm/sec^2
48.o	$A_{B_Z} D_1 = \lvert \text{line cb} - \text{line ag} \rvert$	cm/sec^2
	$A_{B_Z} D_2 = D_1 + \lvert \text{line cc} - \text{line cb} \rvert$	cm/sec^2
	$A_{B_Z} D_3 = D_2 + \lvert \text{line cd} - \text{line cc} \rvert$	cm/sec^2

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.a	Initial BD_XD_1	meru	▨		6.0	▨	▨
	Initial BD_XD_2	meru	▨		9.0	▨	▨
	Initial BD_XD_3	meru	▨		11.0	▨	▨
48.a	Final BD_XD_1	meru	▨		6.0		
or	Final BD_XD_2	meru	▨		9.0		
54.a	Final BD_XD_3	meru	▨		11.0		
48.b	Initial BD_YD_1	meru	▨		6.0	▨	▨
	Initial BD_YD_2	meru	▨		9.0	▨	▨
	Initial BD_YD_3	meru	▨		11.0	▨	▨
48.b	Final BD_YD_1	meru	▨		6.0		
or	Final BD_YD_2	meru	▨		9.0		
54.b	Final BD_YD_3	meru	▨		11.0		
48.c	Initial BD_ZD_1	meru	▨		6.0	▨	▨
	Initial BD_ZD_2	meru	▨		9.0	▨	▨
	Initial BD_ZD_3	meru	▨		11.0	▨	▨
48.c	Final BD_ZD_1	meru	▨		6.0		
or	Final BD_ZD_2	meru	▨		9.0		
54.c	Final BD_ZD_3	meru	▨		11.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.d	Initial $ADSRA_XD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_XD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_XD_3$	meru/g	▨		25.0	▨	▨
48.d	Final $ADSRA_XD_1$	meru/g	▨		14.0		
or	Final $ADSRA_XD_2$	meru/g	▨		21.0		
54.d	Final $ADSRA_XD_3$	meru/g	▨		25.0		
48.e	Initial $ADSRA_YD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_YD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_YD_3$	meru/g	▨		25.0	▨	▨
48.e	Final $ADSRA_YD_1$	meru/g	▨		14.0		
or	Final $ADSRA_YD_2$	meru/g	▨		21.0		
54.e	Final $ADSRA_YD_3$	meru/g	▨		25.0		
48.f	Initial $ADSRA_ZD_1$	meru/g	▨		14.0	▨	▨
	Initial $ADSRA_ZD_2$	meru/g	▨		21.0	▨	▨
	Initial $ADSRA_ZD_3$	meru/g	▨		25.0	▨	▨
48.f	Final $ADSRA_ZD_1$	meru/g	▨		14.0		
or	Final $ADSRA_ZD_2$	meru/g	▨		21.0		
54.f	Final $ADSRA_ZD_3$	meru/g	▨		25.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.g	Initial $ADIA_XD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_XD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_XD_3$	meru/g	▨		40.0	▨	▨
48.g	Final $ADIA_XD_1$	meru/g	▨		17.0		
or	Final $ADIA_XD_2$	meru/g	▨		33.0		
54.g	Final $ADIA_XD_3$	meru/g	▨		40.0		
48.h	Initial $ADIA_YD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_YD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_YD_3$	meru/g	▨		40.0	▨	▨
48.h	Final $ADIA_YD_1$	meru/g	▨		17.0		
or	Final $ADIA_YD_2$	meru/g	▨		33.0		
54.h	Final $ADIA_YD_3$	meru/g	▨		40.0		
48.i	Initial $ADIA_ZD_1$	meru/g	▨		17.0	▨	▨
	Initial $ADIA_ZD_2$	meru/g	▨		33.0	▨	▨
	Initial $ADIA_ZD_3$	meru/g	▨		40.0	▨	▨
48.i	Final $ADIA_ZD_1$	meru/g	▨		17.0		
or	Final $ADIA_ZD_2$	meru/g	▨		33.0		
54.i	Final $ADIA_ZD_3$	meru/g	▨		40.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.j	Initial $\Delta SF(A)_XD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_XD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_XD_3$	ppm	▨		600	▨	▨
48.j	Final $\Delta SF(A)_XD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_XD_2$	ppm	▨		500		
54.j	Final $\Delta SF(A)_XD_3$	ppm	▨		600		
48.k	Initial $\Delta SF(A)_YD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_YD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_YD_3$	ppm	▨		600	▨	▨
48.k	Final $\Delta SF(A)_YD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_YD_2$	ppm	▨		500		
54.k	Final $\Delta SF(A)_YD_3$	ppm	▨		600		
48.l	Initial $\Delta SF(A)_ZD_1$	ppm	▨		400	▨	▨
	Initial $\Delta SF(A)_ZD_2$	ppm	▨		500	▨	▨
	Initial $\Delta SF(A)_ZD_3$	ppm	▨		600	▨	▨
48.l	Final $\Delta SF(A)_ZD_1$	ppm	▨		400		
or	Final $\Delta SF(A)_ZD_2$	ppm	▨		500		
54.l	Final $\Delta SF(A)_ZD_3$	ppm	▨		600		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.m	Initial $A_{B_X} D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_X} D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_X} D_3$	cm/sec^2	▨		0.90	▨	▨
48.m	Final $A_{B_X} D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_X} D_2$	cm/sec^2	▨		0.70		
54.m	Final $A_{B_X} D_3$	cm/sec^2	▨		0.90		
48.n	Initial $A_{B_Y} D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_Y} D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_Y} D_3$	cm/sec^2	▨		0.90	▨	▨
48.n	Final $A_{B_Y} D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_Y} D_2$	cm/sec^2	▨		0.70		
54.n	Final $A_{B_Y} D_3$	cm/sec^2	▨		0.90		
48.o	Initial $A_{B_Z} D_1$	cm/sec^2	▨		0.50	▨	▨
	Initial $A_{B_Z} D_2$	cm/sec^2	▨		0.70	▨	▨
	Initial $A_{B_Z} D_3$	cm/sec^2	▨		0.90	▨	▨

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
48.o	Final $A_{B_Z} D_1$	cm/sec^2	▨		0.50		
or	Final $A_{B_Z} D_2$	cm/sec^2	▨		0.70		
54.o	Final $A_{B_Z} D_3$	cm/sec^2	▨		0.90		
50 (1)	Gyro WHEEL	Time	▨		▨	▨	▨
50 (2.a)	X PIPA G/S output	Volts p-p	▨		15		
50 (2.b)	Y PIPA G/S output	Volts p-p	▨		15		
50 (2.c)	Z PIPA G/S output	Volts p-p	▨		15		
50 (6.f.1)	X PIPA PVR	Volts dc	5.94		6.06		
50 (6.f.2)	Y PIPA PVR	Volts dc	5.94		6.06		
50 (6.f.3)	Z PIPA PVR	Volts dc	5.94		6.06		
50 (11)	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (17)	+BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a.1
50 (18)	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	b.1
50 (21)	+BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c.1
50 (22)	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	d.1
50 (23)	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e.1
50 (23A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (23A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (26)	-BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f.1
50 (27)	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	g.1

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (30)	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	h.1
50 (31)	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	i.1
50 (32)	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	j.1
50 (32A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (32A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
50 (36)	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.__	▨	▨	▨	k.1
50 (37)	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	m.1
50 (40)	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	n.1
50 (41)	-BDZ - ADSRAZ = (line k.1) -2 (line c.1) =	meru	▨	( )___.__	▨	▨	▨	p.1

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (42)	-Y PIPA Test (ROW 1 indication) Position + 00006 (ROW 2 indication)	cm/sec^2	▨	( ) _ _ _ _ _. ( ) _ _ _ _ _.	▨	▨	▨	q. 1
50 (43. f)	Time of ENTR	Time	▨	_ _hrs_ _min_ _sec	▨	▨	▨	
50 (43. g)	ROW 1 indication	deg	▨	( ) _ _ _. _ _	▨	▨	▨	
	ROW 2 indication	deg	▨	( ) _ _ _. _ _	▨	▨	▨	
	ROW 3 indication	deg	▨	( ) _ _ _. _ _	▨	▨	▨	
50 (43. i)	Time of ENTR	Time	▨	_ _hrs_ _min_ _sec	▨	▨	▨	
50 (43. j)	ROW 1 indication	deg	▨	( ) _ _ _. _ _	▨	▨	▨	
	ROW 2 indication	deg	▨	( ) _ _ _. _ _	▨	▨	▨	
	ROW 3 indication	deg	▨	( ) _ _ _. _ _	▨	▨	▨	
50 (43. m)	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( ) _ _ _. _ _	▨	▨	▨	r. 1

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JDC ITEM NO.	CALCULATIONS	
50 (47. a)	BD_X = - (line f. 1) = ( )	meru
50 (47. b)	BD_Y = line a. 1 = ( )	meru
50 (47. c)	BD_Z = line c. 1 = ( )	meru
50 (47. d)	$ADSRA_X$ = line n. 1 + line f. 1 = ( )	meru/g
50 (47. e)	$ADSRA_Y$ = line h. 1 - line a. 1 = ( )	meru/g

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JDC ITEM NO.	CALCULATIONS	
50 (47. f)	$ADSRA_Z$ = - (line k. 1) + line c. 1 = ( )	meru/g
50 (47. g)	$ADIA_X$ = -1 [(line e. 1) + (line f. 1)] = ( )	meru/g
50 (47. h)	$ADIA_Y$ = line r. 1 + line a. 1 = ( )	meru/g
50 (47. i)	$ADIA_Z$ = line j. 1 - line c. 1 = ( )	meru/g
50 (47. j)	g = _ _ _. _ _ (Enter local gravity from Table 4)	cm/sec^2
	$SF(A)_X = \frac{2g \times 5.850000}{\text{line b. 1 - line d. 1}}$	cm/sec/pulse
	$\Delta SF(A)_X = \frac{\left[SF(A)_X - 5.85\right] \times 10^6}{5.85}$	ppm

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JDC ITEM NO.	CALCULATIONS	
50 (47. k)	$SF(A)_Y = \frac{2g \times 5.850000}{\text{line m. 1 - line q. 1}}$	cm/sec/pulse
	$\Delta SF(A)_Y = \frac{\left[SF(A)_Y - 5.85\right] \times 10^6}{5.85}$	ppm
50 (47. l)	$SF(A)_Z = \frac{2g \times 5.850000}{\text{line g. 1 - line i. 1}}$	cm/sec/pulse
	$\Delta SF(A)_Z = \frac{\left[SF(A)_Z - 5.85\right] \times 10^6}{5.85}$	ppm
50 (47. m)	$A_{B_X} = \frac{\text{line b. 1 + line d. 1}}{2}$	cm/sec^2
50 (47. n)	$A_{B_Y} = \frac{\text{line m. 1 + line q. 1}}{2}$	cm/sec^2
50 (47. o)	$A_{B_Z} = \frac{\text{line i. 1 + line g. 1}}{2}$	cm/sec^2

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EQUIPMENT TEST
DATA SHEET 25 OF 43

JDC
NO. 12217
REV. N

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (47.a)	B_{D_X}	meru	-15.0		+15.0			s.1
50 (47.b)	B_{D_Y}	meru	-15.0		+15.0			t.1
50 (47.c)	B_{D_Z}	meru	-15.0		+15.0			u.1
50 (47.d)	$ADSRA_X$	meru/g	-40.0		+40.0			v.1
50 (47.e)	$ADSRA_Y$	meru/g	-40.0		+40.0			w.1
50 (47.f)	$ADSRA_Z$	meru/g	-40.0		+40.0			x.1
50 (47.g)	$ADIA_X$	meru/g	-100		+100			y.1
50 (47.h)	$ADIA_Y$	meru	-100		+100			z.1
50 (47.i)	$ADIA_Z$	meru/g	-100		+100			aa.1
50 (47.j)	$\Delta SF(A)_X$	ppm	-1900		+1900			ab.1
50 (47.k)	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac.1
50 (47.l)	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad.1

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EQUIPMENT TEST
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JDC
NO. 12217
REV. N

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
50 (47.m)	A_{B_X}	cm/sec^2	-2.20		+2.20			ae.1
50 (47.n)	A_{B_Y}	cm/sec^2	-2.20		+2.20			af.1
50 (47.o)	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag.1
53 (1)	Gyro WHEEL	Time	▨		▨	▨	▨	
53 (2.a)	X PIPA G/S output	Volts p-p	▨		15			
53 (2.b)	Y PIPA G/S output	Volts p-p	▨		15			
53 (2.c)	Z PIPA G/S output	Volts p-p	▨		15			
53 (6.f.1)	X PIPA PVR	Volts dc	5.94		6.06			
53 (6.f.2)	Y PIPA PVR	Volts dc	5.94		6.06			
53 (6.f.3)	Z PIPA PVR	Volts dc	5.94		6.06			
53 (11)	X PIPA TCM	Volts dc	0.98		1.08			
	Y PIPA TCM	Volts dc	0.98		1.08			

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NO. 12217
REV. N

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (11) (cont)	Z PIPA TCM	Volts dc	0.98		1.08			
53 (17)	+BDY (ROW 2 indication) Position +00001	meru	▨	( )___.__	▨	▨	▨	a.2
53 (18)	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	b.2
53 (21)	+BDZ (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	c.2
53 (22)	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	d.2
53 (23)	-BDX + ADIAX (ROW 2 indication) Position +00002	meru	▨	( )___.__	▨	▨	▨	e.2
53 (23A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (23A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (26)	-BDX (ROW 2 indication) Position +00003	meru	▨	( )___.__	▨	▨	▨	f.2

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EQUIPMENT TEST
DATA SHEET 28 OF 43

JDC
NO. 12217
REV. N

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (27)	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	g.2
53 (30)	+BDY + ADSRAY (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	h.2
53 (31)	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	i.2
53 (32)	+BDZ + ADIAZ (ROW 2 indication) Position +00004	meru	▨	( )___.__	▨	▨	▨	j.2
53 (32A.c)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (32A.f)	ROW 1 indication	deg	▨	___.__	▨	▨	▨	
53 (36)	+BDZ - ADSRAZ (ROW 2 indication) Position +00005	meru	▨	( )___.__	▨	▨	▨	k.2
53 (37)	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	m.2
53 (40)	+BDX + ADSRAX (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	n.2

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EQUIPMENT TEST
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JDC
NO. 12217
REV. N

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (41)	-BDZ - ADSRAZ = (line k.2) -2 (line c.2) =	meru	▨	( )___.__	▨	▨	▨	p.2
53 (42)	-Y PIPA Test (ROW 1 indication) Position +00006 (ROW 2 indication)	cm/sec^2	▨	( )_____. ( )_____	▨	▨	▨	q.2
53 (43.f)	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
53 (43.g)	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
53 (43.i)	Time of ENTR	Time	▨	__hrs__min__sec	▨	▨	▨	
53 (43.j)	ROW 1 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 2 indication	deg	▨	( )___.__	▨	▨	▨	
	ROW 3 indication	deg	▨	( )___.__	▨	▨	▨	
53 (43.m)	-BDY + ADIAY (ROW 2 indication) Position +00006	meru	▨	( )___.__	▨	▨	▨	r.2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS
53 (47.a)	BD_X = - (line f.2) = ( ) meru
53 (47.b)	BD_Y = line a.2 = ( ) meru
53 (47.c)	BD_Z = line c.2 = ( ) meru
53 (47.d)	$ADSRA_X$ = line n.2 + line f.2 = ( ) meru/g

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JDC
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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS
53 (47.e)	$ADSRA_Y$ = line h.2 - line a.2 = ( ) meru/g
53 (47.f)	$ADSRA_Z$ = - (line k.2) + line c.2 = ( ) meru/g
53 (47.g)	$ADIA_X = -1 \left[-(\text{line e.2}) + (\text{line f.2}) \right]$ = ( ) meru/g
53 (47.h)	$ADIA_Y$ = line r.2 + line a.2 = ( ) meru/g
53 (47.i)	$ADIA_Z$ = line j.2 - line c.2 = ( ) meru/g
53 (47.j)	g = ___.__ (Enter local gravity from Table 4) cm/sec^2
	$SF(A)_X = \dfrac{2g \times 5.850000}{\text{line b.2} - \text{line d.2}}$ cm/sec/pulse
	$\Delta SF(A)_X = \dfrac{\left[SF(A)_X - 5.85\right] \times 10^6}{5.85}$ ppm

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS
53 (47.k)	$SF(A)_Y = \dfrac{2g \times 5.850000}{\text{line m.2} - \text{line q.2}}$ cm/sec/pulse
	$\Delta SF(A)_Y = \dfrac{\left[SF(A)_Y - 5.85\right] \times 10^6}{5.85}$ ppm
53 (47.l)	$SF(A)_Z = \dfrac{2g \times 5.850000}{\text{line g.2} - \text{line i.2}}$ cm/sec/pulse
	$\Delta SF(A)_Z = \dfrac{\left[SF(A)_Z - 5.85\right] \times 10^6}{5.85}$ ppm
53 (47.m)	$A_{B_X} = \dfrac{\text{line b.2} + \text{line d.2}}{2}$ cm/sec^2
53 (47.n)	$A_{B_Y} = \dfrac{\text{line m.2} + \text{line q.2}}{2}$ cm/sec^2
53 (47.o)	$A_{B_Z} = \dfrac{\text{line i.2} + \text{line g.2}}{2}$ cm/sec^2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (47.a)	B_{D_X}	meru	-15.0		+15.0			s.2
53 (47.b)	B_{D_Y}	meru	-15.0		+15.0			t.2
53 (47.c)	B_{D_Z}	meru	-15.0		+15.0			u.2
53 (47.d)	$ADSRA_X$	meru/g	-40.0		+40.0			v.2
53 (47.e)	$ADSRA_Y$	meru/g	-40.0		+40.0			w.2
53 (47.f)	$ADSRA_Z$	meru/g	-40.0		+40.0			x.2
53 (47.g)	$ADIA_X$	meru/g	-100		+100			y.2
53 (47.h)	$ADIA_Y$	meru/g	-100		+100			z.2
53 (47.i)	$ADIA_Z$	meru/g	-100		+100			aa.2
53 (47.j)	$\Delta SF(A)_X$	ppm	-1900		+1900			ab.2
53 (47.k)	$\Delta SF(A)_Y$	ppm	-1900		+1900			ac.2
53 (47.l)	$\Delta SF(A)_Z$	ppm	-1900		+1900			ad.2

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
53 (47.m)	A_{B_X}	cm/sec^2	-2.20		+2.20			ae.2
53 (47.n)	A_{B_Y}	cm/sec^2	-2.20		+2.20			af.2
53 (47.o)	A_{B_Z}	cm/sec^2	-2.20		+2.20			ag.2

JDC ITEM NO.	CALCULATIONS	
54.a	$BD_XD_1 = \lvert \text{line s.1 - line s.2} \rvert$	meru
	$BD_XD_2 = D_1 + \lvert \text{line s - line s.1} \rvert$	meru
	$BD_XD_3 = D_2 + \lvert \text{line ah - line s} \rvert$	meru
54.b	$BD_YD_1 = \lvert \text{line t.1 - line t.2} \rvert$	meru
	$BD_YD_2 = D_1 + \lvert \text{line t - line t.1} \rvert$	meru
	$BD_YD_3 = D_2 + \lvert \text{line as - line t} \rvert$	meru

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JDC ITEM NO.	CALCULATIONS	
54.c	$BD_ZD_1 = \lvert \text{line u.1 - line u.2} \rvert$	meru
	$BD_ZD_2 = D_1 + \lvert \text{line u - line u.1} \rvert$	meru
	$BD_ZD_3 = D_2 + \lvert \text{line bb - line u} \rvert$	meru
54.d	$ADSRA_XD_1 = \lvert \text{line v.1 - line v.2} \rvert$	meru/g
	$ADSRA_XD_2 = D_1 + \lvert \text{line v - line v.1} \rvert$	meru/g
	$ADSRA_XD_3 = D_2 + \lvert \text{line ak - line v} \rvert$	meru/g
54.e	$ADSRA_YD_1 = \lvert \text{line w.1 - line w.2} \rvert$	meru/g
	$ADSRA_YD_2 = D_1 + \lvert \text{line w - line w.1} \rvert$	meru/g
	$ADSRA_YD_3 = D_2 + \lvert \text{line av - line w} \rvert$	meru/g

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JDC
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REV N

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
54.f	$ADSRA_ZD_1 = \lvert \text{line x.1 - line x.2} \rvert$	meru/g
	$ADSRA_ZD_2 = D_1 + \lvert \text{line x - line x.1} \rvert$	meru/g
	$ADSRA_ZD_3 = D_2 + \lvert \text{line be - line x} \rvert$	meru/g
54.g	$ADIA_XD_1 = \lvert \text{line y.1 - line y.2} \rvert$	meru/g
	$ADIA_XD_2 = D_1 + \lvert \text{line y - line y.1} \rvert$	meru/g
	$ADIA_XD_3 = D_2 + \lvert \text{line ap - line y} \rvert$	meru/g
54.h	$ADIA_YD_1 = \lvert \text{line z.1 - line z.2} \rvert$	meru/g
	$ADIA_YD_2 = D_1 + \lvert \text{line z - line z.1} \rvert$	meru/g
	$ADIA_YD_3 = D_2 + \lvert \text{line ay - line z} \rvert$	meru/g

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JOB IMU PERFORMANCE TEST

JDC ITEM NO.	CALCULATIONS	
54.i	$ADIA_Z D_1 = \lvert \text{line aa.1} - \text{line aa.2} \rvert$	meru/g
	$ADIA_Z D_2 = D_1 + \lvert \text{line aa} - \text{line aa.1} \rvert$	meru/g
	$ADIA_Z D_3 = D_2 + \lvert \text{line bh} - \text{line aa} \rvert$	meru/g
54.j	$\Delta SF(A)_X D_1 = \lvert \text{line ab.1} - \text{line ab.2} \rvert$	ppm
	$\Delta SF(A)_X D_2 = D_1 + \lvert \text{line ab} - \text{line ab.1} \rvert$	ppm
	$\Delta SF(A)_X D_3 = D_2 + \lvert \text{line bk} - \text{line ab} \rvert$	ppm
54.k	$\Delta SF(A)_Y D_1 = \lvert \text{line ac.1} - \text{line ac.2} \rvert$	ppm
	$\Delta SF(A)_Y D_2 = D_1 + \lvert \text{line ac} - \text{line ac.1} \rvert$	ppm
	$\Delta SF(A)_Y D_3 = D_2 + \lvert \text{line bs} - \text{line ac} \rvert$	ppm

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JDC ITEM NO.	CALCULATIONS	
54.l	$\Delta SF(A)_Z D_1 = \lvert \text{line ad.1} - \text{line ad.2} \rvert$	ppm
	$\Delta SF(A)_Z D_2 = D_1 + \lvert \text{line ad} - \text{line ad.1} \rvert$	ppm
	$\Delta SF(A)_Z D_3 = D_2 + \lvert \text{line by} - \text{line ad} \rvert$	ppm
54.m	$A_{B_X} D_1 = \lvert \text{line ae.1} - \text{line ae.2} \rvert$	cm/sec^2
	$A_{B_X} D_2 = D_1 + \lvert \text{line ae} - \text{line ae.1} \rvert$	cm/sec^2
	$A_{B_X} D_3 = D_2 + \lvert \text{line bp} - \text{line ae} \rvert$	cm/sec^2
54.n	$A_{B_Y} D_1 = \lvert \text{line af.1} - \text{line af.2} \rvert$	cm/sec^2
	$A_{B_Y} D_2 = D_1 + \lvert \text{line af} - \text{line af.1} \rvert$	cm/sec^2
	$A_{B_Y} D_3 = D_2 + \lvert \text{line bv} - \text{line af} \rvert$	cm/sec^2

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JDC ITEM NO.	CALCULATIONS	
54.o	$A_{B_Z} D_1 = \lvert \text{line ag.1} - \text{line ag.2} \rvert$	cm/sec^2
	$A_{B_Z} D_2 = D_1 + \lvert \text{line ag} - \text{line ag.1} \rvert$	cm/sec^2
	$A_{B_Z} D_3 = D_2 + \lvert \text{line cb} - \text{line ag} \rvert$	cm/sec^2

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4.

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TEST	COEFFICIENT	VALUE	TEST DATE	
IRIG I & A JDC 16236 JDC 12217 Spacecraft	(EXAMPLE) Last Historical BD_X	+1.46	3/8/67	
	(EXAMPLE) Second Last Historical BD_X	+1.09	2/15/67	
	(EXAMPLE) Third Last Historical BD_X	-0.29	1/24/67	
IRIG I & A JDC 16236 JDC 12217 Spacecraft	Last Historical BD_X			ah
	Second Last Historical BD_X			ai
	Third Last Historical BD_X			aj
IRIG I & A JDC 16236 JDC 12217 Spacecraft	Last Historical $ADSRA_X$			ak
	Second Last Historical $ADSRA_X$			am
	Third Last Historical $ADSRA_X$			an
IRIG I & A JDC 16237 JDC 12217 Spacecraft	Last Historical $ADIA_X$			ap
	Second Last Historical $ADIA_X$			aq
	Third Last Historical $ADIA_X$			ar
IRIG I & A JDC 16239 JDC 12217 Spacecraft	Last Historical BD_Y			as
	Second Last Historical BD_Y			at
	Third Last Historical BD_Y			au

Table 5

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TEST	COEFFICIENT	VALUE	TEST DATE	
IRIG I & A JDC 16239 JDC 12217 Spacecraft	Last Historical $ADSRA_Y$			av
	Second Last Historical $ADSRA_Y$			aw
	Third Last Historical $ADSRA_Y$			ax
IRIG I & A JDC 16240 JDC 12217 Spacecraft	Last Historical $ADIA_Y$			ay
	Second Last Historical $ADIA_Y$			az
	Third Last Historical $ADIA_Y$			ba
IRIG I & A JDC 16242 JDC 12217 Spacecraft	Last Historical BD_Z			bb
	Second Last Historical BD_Z			bc
	Third Last Historical BD_Z			bd
IRIG I & A JDC 16242 JDC 12217 Spacecraft	Last Historical $ADSRA_Z$			be
	Second Last Historical $ADSRA_Z$			bf
	Third Last Historical $ADSRA_Z$			bg
IRIG I & A JDC 16243 JDC 12217 Spacecraft	Last Historical $ADIA_Z$			bh
	Second Last Historical $ADIA_Z$			bi
	Third Last Historical $ADIA_Z$			bj
JDC 14155 JDC 14201 JDC 12217 Spacecraft	Last Historical $\Delta SF(A)_X$			bk
	Second Last Historical $\Delta SF(A)_X$			bm
	Third Last Historical $\Delta SF(A)_X$			bn

Table 5 (cont)

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JDC		VALUE	TEST DATE	
JDC 14155 JDC 14201 JDC 12217 Spacecraft	Last Historical A_{B_X}			bp
	Second Last Historical A_{B_X}			bq
	Third Last Historical A_{B_X}			br
JDC 14156 JDC 14203 JDC 12217 Spacecraft	Last Historical $\Delta SF(A)_Y$			bs
	Second Last Historical $\Delta SF(A)_Y$			bt
	Third Last Historical $\Delta SF(A)_Y$			bu
JDC 14156 JDC 14203 JDC 12217 Spacecraft	Last Historical A_{B_Y}			bv
	Second Last Historical A_{B_Y}			bw
	Third Last Historical A_{B_Y}			bx
JDC 14157 JDC 14205 JDC 12217 Spacecraft	Last Historical $\Delta SF(A)_Z$			by
	Second Last Historical $\Delta SF(A)_Z$			bz
	Third Last Historical $\Delta SF(A)_Z$			ca
JDC 14157 JDC 14205 JDC 12217 Spacecraft	Last Historical A_{B_Z}			cb
	Second Last Historical A_{B_Z}			cc
	Third Last Historical A_{B_Z}			cd

Table 5 (cont)

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JDC
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JOB IMU PERFORMANCE TEST

COEFFICIENT	JDC STEPS TO BE PREPARED																																					PARAMETERS TO BE CALCULATED	ENG. APPROVAL
	1→14	15	16	17	18	19	20	21	Ⓐ	22	22A	23	23A	24	25	26	27	28	29	30	31	31A	32	32A	33	34	35	36	37	38	39	40	41	42	42A	43	44→47		
BD_X	X														X	X																					X	BD_X	
BD_Y	X	X	X	X																																	X	BD_Y	
BD_Z	X						X	X																													X	BD_Z	
$ADSRA_X$	X														X	X											X			X	X	X					X	$ADSRA_X$ and BD_X	
$ADSRA_Y$	X	X	X	X														X	X	X																	X	$ADSRA_Y$ and BD_Y	
$ADSRA_Z$	X						X	X	X																	X	X	X									X	$ADSRA_Z$ and BD_Z	
$ADIA_X$	X	X	X	X		X	X	X		X	X	X	X	X	X	X																					X	$ADIA_X$, BD_X, BD_Y, and BD_Z	
$ADIA_Y$	X	X	X	X		X	X	X	X																	X	X	X		X	X	X	X	X	X	X	X	$ADIA_Y$, BD_Y, $ADSRA_Z$, and BD_Z	
$ADIA_Z$	X						X	X	X						X	X		X	X	X	X	X	X	X													X	$ADIA_Z$, BD_Z, and BD_X	
AB_X or $\Delta SF(A)_X$	X	X	X	X	X	X	X	X		X																											X	AB_X, $\Delta SF(A)_X$, BD_Y, and BD_Z	
AB_Y or $\Delta SF(A)_Y$	X																									X	X	X	X	X	X	X		X			X	AB_Y and $\Delta SF(A)_Y$	
AB_Z or $\Delta SF(A)_Z$	X														X	X	X	X	X	X	X																X	AB_Z, $\Delta SF(A)_Z$, and BD_X	

Ⓐ Perform the following DSKY Operation:

VERB 34, PRESS ENTR

Table 6

DATE 30 JUN 66

JOB IMU PERFORMANCE TEST

JDC 12217 REV. - PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 9

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The three IRIG coefficient terms, NBD, ADSRA, and ADIA, are determined and the scale factor and bias terms are determined for each PIPA, the test is computer controlled and requires six IMU positions to determine all parameters.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES PS 2015000

IMPORTANT Fill in Table 5 before proceeding with this JDC.

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Establish a Master Initialization condition. Insure that the G & N Mounting Fixture is set to +32.5°, that the IMU operate power and CGC power has been applied for a minimum of one hour and that the IMU is not in a gimbal lock position. Record gyro WHEEL time.

PIPA TLM INTERFACE TEST

2. Measure and record the following signals on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to positions indicated:

SIGNAL	CROSSBAR CONTROL
a. X PIPA G/S output	251
b. Y PIPA G/S output	152
c. Z PIPA G/S output	252

X, Y AND Z PIPA PVR MEASUREMENTS

3. Set the RANGE switch on the Galvanometer to 1 VOLT.

4. Set the VOLTAGE RANGE selector on the Current Source Monitor panel to TEMP READ and the SELECTOR switch to MEAS-

5. Adjust the VOLTAGE ratio transformer on the Galvanometer to obtain a minimum null on the meter. Insure the VOLTAGE ratio transformer indicates 50000 (±01250) before proceeding. Set the RANGE switch to 1 VOLT.

6. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 1 as follows:

a. Set the SELECTOR switch to ZERO and the VOLTAGE RANGE selector to 5-6.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ____________

JOB IMU PERFORMANCE TEST

JDC 12217 REV - PAGE 2 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

b. Adjust the RANGE switch and ZERO control to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

c. Set the SELECTOR switch to STANDARDIZE.

d. Adjust the RANGE switch and STANDARDIZE potentiometer to obtain a minimum null on the meter. Set the RANGE switch to 1 VOLT.

e. Set the SELECTOR switch to MEASURE and adjust the RANGE switch and VOLTAGE ratio transformer to obtain a minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

NOTE: If a null cannot be obtained with the VOLTAGE RANGE selector set to 5-6, set the selector to 6-7 and repeat steps c through e.

f. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA PVR	1
2	Y PIPA PVR	4
3	Z PIPA PVR	7

Table 1

X, Y AND Z PIPA TCM MEASUREMENTS

7. Set the SELECTOR switch on the Current Source Monitor panel to ZERO and the VOLTAGE RANGE switch to 1.0 - 1.1.

8. Adjust the RANGE switch and ZERO control on the Galvanometer to obtain minimum null on meter. Set the RANGE switch to 1 VOLT.

9. Set the SELECTOR switch on Current Source Monitor panel to STANDARDIZE.

10. Adjust the RANGE switch and STANDARDIZE pot to obtain a minimum null. Set the RANGE switch to 1 VOLT.

11. Measure the ratio transformer indication for each of the PTA/PEA TEST POINT ADAPTER switch settings specified in Table 2 as follows:

a. Set the SELECTOR switch on the Current Source Monitor panel to MEASURE and adjust RANGE switch and VOLTAGE ratio transformer to obtain minimum null on the meter with a final RANGE switch setting of .3 MILLIVOLTS.

b. Set RANGE switch to 1 VOLT. Record VOLTAGE ratio transformer indication.

c. Set the PIP AND IRIG S. F. MONITOR switch to OFF.

Item	Signal	PTA/PEA PIP AND IRIG S. F. MONITOR Switch Setting
1	X PIPA TCM	2
2	Y PIPA TCM	5
3	Z PIPA TCM	8

Table 2

IMU PERFORMANCE TEST ENTRY

12. Perform following DSKY operations:

VERB 57	ENTR
00001	ENTR

13. When VERB 06 and NOUN 61 flash, insure that ROW 1 indicates +180.00 and that ROW 2 indicates the latitude of the site where this test is being performed (see Table 3).

DATE ____________

JOB IMU PERFORMANCE TEST

JDC 12217 REV - PAGE 3 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

If ROW 1 and ROW 2 are correct, enter VERB 33 and press ENTR pushbutton then proceed to step 15. If ROW 1 and/or ROW 2 are incorrect, proceed to step 14.

Test Site	Latitude
MIT	+42.366
AC	+42.900
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 3

14. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+18000	ENTR

To correct ROW 2 -

VERB 22	ENTR
Test site latitude from Table 3	ENTR

Enter VERB 33 and press ENTR pushbutton.

INITIALIZE TEST POSITION 1

15. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00001. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 17. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 16.

16. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00001	ENTR

+NBDY TEST

17. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+X PIPA S. F. TEST

18. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 2

19. Enter VERB 34 into DSKY and press ENTR pushbtton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00002. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 21. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 20.

20. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00002	ENTR

DATE ____________

JOB IMU PERFORMANCE TEST

JDC 12217 REV - PAGE 4 OF 6

SUBSYSTEM G & N SYSTEM

ASSY

-NBDZ TEST

21. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-X PIPA S. F. TEST

22. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDX+ADIAX TEST

23. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 3

24. Enter VERB 33 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00003. If ROW 1, ROW 2, and ROW 3 are correct, proceed to step 26. If ROW 1, ROW 2, and/or ROW 3 are incorrect, proceed to step 25.

25. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00003	ENTR

-NBDX TEST

26. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Z PIPA S. F. TEST

27. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 4

28. Enter VERB 34 and press ENTR pushbutton on the DSKY. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00000, and ROW 3 indicates +00004. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 30. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 29.

29. Perform the following DSKY operations:

To correct ROW 1 -

VERB 21	ENTR
+00900	ENTR

To correct ROW 2 -

VERB 22	ENTR
+00000	ENTR

To correct ROW 3 -

VERB 23	ENTR
+00004	ENTR

+NBDY + ADSRAY TEST

30. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

DATE ____________

SUBSYSTEM G & N SYSTEM ASSY

-Z PIPA S.F. TEST

31. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDZ+ ADIAZ TEST

32. Enter VERB 33 and press ENTR pushbutton on the DSKY. In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

INITIALIZE TEST POSITION 5

33. Enter VERB 33 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00005. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 35. If ROW 1, ROW 2, and/or ROW 3 indications are incorrect, proceed to step 34.

34. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR
To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00005 ENTR

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

35. Tilt the G & N Mounting Fixture to the 0.0° position.

-NBDZ + ADSRAZ

36. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

+Y PIPA TEST

37. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

INITIALIZE TEST POSITION 6

38. Enter VERB 34 into DSKY and press ENTR pushbutton. When VERB 06 and NOUN 66 flash, insure that ROW 1 indicates +00900, ROW 2 indicates +00037, and ROW 3 indicates +00006. If ROW 1, ROW 2, and ROW 3 indications are correct, proceed to step 40. If ROW 1, ROW2, and/or ROW 3 indications are incorrect, proceed to step 39.

39. Perform the following DSKY operations:

To correct ROW 1 -
VERB 21 ENTR
+00900 ENTR

DATE ________

SUBSYSTEM G & N SYSTEM ASSY

To correct ROW 2 -
VERB 22 ENTR
00006 ENTR
To correct ROW 3 -
VERB 23 ENTR
+00006 ENTR

+NBDX + ADSRAX TEST

40. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 17 minutes, VERB 06 and NOUN 66 will flash. Record ROW 2 indication.

-Y PIPA S. F. TEST

41. Enter VERB 33 into DSKY and press ENTR pushbutton. In approximately 90 seconds, VERB 06 and NOUN 66 will flash. Record ROW 1 and ROW 2 indications.

-NBDY + ADIAY

42. Calculate NBDZ + ADSRAZ. Position 5 (step 36) -2 (position 2) (step 21).

43. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 21 NOUN 01 ENTR
c. 2637 ENTR
d. NBDZ + ADSRAZ value ENTR

In approximately 67 minutes, VERB 06 and NOUN 66 will flash. Record Row 2 indication.

44. Enter VERB 34 into the DSKY and press the ENTR pushbutton.

NOTE: Insure undue strains are not placed on the hoses or cables during the following operation.

45. Set the G & N Mounting Fixture to a +32.5° tilt angle.

46. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. +00000 ENTR
d. +00000 ENTR
e. +00000 ENTR

47. Perform calculations and complete data sheet.

48. Upon completion of data sheet, make a copy of data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC
NO. 12217
REV. -
INITIAL TDRR 2882

JOB IMU PERFORMANCE TEST

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ______ CAL DATE
NAME ________ SER. NO. ______ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1	Gyro WHEEL	Time	▨		▨		
2.a	X PIPA G/S output	Volts ac	-.3		+.3		
2.b	Y PIPA G/S output	Volts ac	-.3		+.3		
2.c	Z PIPA G/S output	Volts ac	-.3		+.3		
6.f.1	X PIPA PVR	Volts dc	5.94		6.06		
6.f.2	Y PIPA PVR	Volts	5.94		6.06		
6.f.3	Z PIPA PVR	Volts dc	5.94		6.06		
11	X PIPA TCM	Volts dc	0.98		1.08		
	Y PIPA TCM	Volts dc	0.98		1.08		
	Z PIPA TCM	Volts dc	0.98		1.08		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC
NO. 12217
REV. -

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
17	+N BDY (ROW 2 indication) Position +00001	meru	▨	( )____.___	▨	▨	▨	a
18	+X PIPA Test (ROW 1 indication) Position +00001 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	b
21	-N BDZ (ROW 2 indication) Position +00002	meru	▨	( )____.___	▨	▨	▨	c
22	-X PIPA Test (ROW 1 indication) Position +00002 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	d
23	-N BDX +ADIAX (ROW 2 indication) Position +00002	meru	▨	( )____.___	▨	▨	▨	e
26	-N BDX (ROW 2 indication) Position +00003	meru	▨	( )____.___	▨	▨	▨	f
27	+Z PIPA Test (ROW 1 indication) Position +00003 (ROW 2 indication)	cm/sec^2	▨	( )______. ( )______	▨	▨	▨	g

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12217
REV. -

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30	+N BDY + ADSRAY (ROW 2 indication) Position +00004	meru		( )___.___				h
31	-Z PIPA Test (ROW 1 indication) Position +00004 (ROW 2 indication)	cm/sec^2		( )_____. ( )_____				i
32	-N BDZ + ADIAZ (ROW 2 indication) Position +00004	meru		( )___.___				j
36	-N BDZ + ADSRAZ (ROW 2 indication) Position +00005	meru		( )___.___				k
37	+Y PIPA Test (ROW 1 indication) Position +00005 (ROW 2 indication)	cm/sec^2		( )_____. ( )_____				l
40	+N BDX + ADSRAX (ROW 2 indication) Position +00006	meru		( )___.___				m
41	-Y PIPA Test (ROW 1 indication) Position +00006 (Row 2 indication)	cm/sec^2		( )_____. ( )_____				n

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
NO. 12217
REV. -

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
42	NBDZ + ADSRAZ = Position 5 -2 (Position 2)	meru		( )___.___				o
43	-N BDY + ADIAY (ROW 2 indication) Position +00006	meru		( )___.___				p

LINE	CALCULATION	PARAMETER	UNITS
q	-1 [- line e + line f] = ( )	ADIAX	meru
r	line h - line a = ( )	ADSRAY	meru
s	-1 [- line j + line c] = ( )	ADIAZ	meru
t	[line k - line c] = ( )	ADSRAZ	meru
u	line m + line f = ( )	ADSRAX	meru
v	line p + line a = ( )	ADIAY	meru
w	line b - line d = ( )	PIPA X 2G	cm/sec^2
x	line l - line n = ( )	PIPA Y 2G	cm/sec^2
y	line i - line g = ( )	PIPA Z 2G	cm/sec^2
z	Enter local gravity (Table 4)____.__		cm/sec^2
aa	Nominal PIPA S. F. = 5.850000		cm/sec/ pulse

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC
NO. 12217
REV. -

JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ab	Multiply line z by line aa =		
ac	2 times line ab =		
ad	line ac ÷ line w = Enter this value on line bb		
ae	line ac ÷ line x = Enter this value on line bc		
af	line ac ÷ line y = Enter this value on line bd		
ag	1/2 (line b + line d) = ( ) __.___ Enter this value on line be		
ah	1/2 (line i + line g) = ( ) _.___ Enter this value on line bf		
ai	1/2 (line l + line n) = ( ) __.___ Enter this value on line bg.		
	Perform the following calculations for values of Δ BD, Δ ADSRA, and ΔADIA. The constants are obtained from Table 5. Transfer results to items ar through az on data sheet.		
aj	ΔBDY = (line a) -(BDY) ΔBDY =		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC
NO. 12217
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JOB IMU PERFORMANCE TEST

LINE	CALCULATION	PARAMETER	UNITS
ak	ΔBDZ = (-line c) - (BDZ) ΔBDZ =		
al	ΔBDX = (- line f) - (BDX) ΔBDX =		
am	ΔADSRAY = (line r) - (ADSRAY) ΔADSRAY =		
an	ΔADSRAZ = (line t) - (ADSRAZ) ΔADSRAZ =		
ao	ΔADSRAX = (line u) - (ADSRAX) ΔADSRAX =		
ap	ΔADIAX = (line q) - (ADIAX) ΔADIAX =		
aq	ΔADIAZ = (line s) - (ADIAZ) ΔADIAZ =		
ar	ΔADIAY = (line v) - (ADIAY) ΔADIAY =		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC
NO. 12217
REV. -

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
as	ΔBDY	meru	-5.0		+5.0		
at	ΔBDZ	meru	-5.0		+5.0		
au	ΔBDX	meru	-5.0		+5.0		
av	ΔADSRAY	meru	-10.0		+10.0		
aw	ΔADSRAZ	meru	-10.0		+10.0		
ax	ΔADSRAX	meru	-10.0		+10.0		
ay	Δ ADIAX	meru	-15.0		+15.0		
az	ΔADIAZ	meru	-15.0		+15.0		
ba	ΔADIAY	meru	-15.0		+15.0		
bb	X PIPA S.F. from line ad	cm/sec /pulse	5.848537		5.851463		
bc	Y PIPA S.F. from line ae	cm/sec /pulse	5.848537		5.851463		
bd	Z PIPA S.F. from line af	cm/sec /pulse	5.848537		5.851463		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC
NO. 12217
REV. -

JOB IMU PERFORMANCE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
be	X PIPA Bias from line ag	cm/sec^2	-5.0		+5.0		
bf	Y PIPA Bias from line ah	cm/sec^2	-5.0		+5.0		
bg	Z PIPA Bias from line ai	cm/sec^2	-5.0		+5.0		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 9

JDC
NO. 12217
REV.

JOB IMU PERFORMANCE TEST

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

Table 4

JDC	PARAMETER	VALUE
16236	BDX	
16236	ADSRAX	
16237	ADIAX	
16239	BDY	
16239	ADSRAY	
16240	ADIAY	
16242	BDZ	
16242	ADSRAZ	
16243	ADIAZ	

Table 5

DATE ________

JOB G & N FINE ALIGN TEST | JDC 12218 REV. A PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6.7	-	EA	WS

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Establish a Master Initialization condition.

2. Make the following switch settings on the Indicator Control panel:

a. OPTICS MODE to ZERO

b. OPTICS SPEED to LO

c. OPTICS COUPLING TO DIRECT

d. OPTICS TRACKER to OFF

e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +135.00

VERIFICATION WITH SIDL REQUIRED BEFORE USE

SUBSYSTEM G & N SYSTEM | ASSY

b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +13500 ENTR

To change only Row 2

c. VERB 22 ENTR

d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 21 NOUN 30 Flashing

c. +00001 ENTR

d. Observe
VERB 22 NOUN 30 Flashing

e. +00000 ENTR

f. Observe
VERB 23 NOUN 30 Flashing

g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +27000

b. Row 2 displays +00000

c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +27000 ENTR

To change only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +18000 ENTR

To change only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence

SUBSYSTEM G & N SYSTEM | ASSY

flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR

b. +18000 ENTR

To correct only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +00000

c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR

b. +13500 ENTR

To correct only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4

SUBSYSTEM G & N SYSTEM | ASSY

location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 2

32. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

33. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 15 seconds then set the OPTICS MODE switch to MAN.

42. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the T PAK shaft readout. (Set the CONTROLLER SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

46. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

---

47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set the CONTROLLER SPEED switch set to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set the OPTICS MODE switch to MANUAL and the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

54. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

56. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34 ENTR
b. The PROG display shall indicate 00
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR

61. Set the G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break the hoses or cables.

62. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.900
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.917

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3
JOB G & N FINE ALIGN TEST

NO. 12218 JDC
REV. A
INITIAL TDRR 29882

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			a
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			b
37	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			c
39	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			d
57	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			e
56	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12218
REV. A

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (Cont)	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12218
REV. A

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
62	Enter the latest values from JDC 12217 X PIPA Bias ____________ cm/sec^2 Y PIPA Bias ____________ cm/sec^2 Z PIPA Bias ____________ cm/sec^2 θ_X = 210 (X PIPA Bias) = ____________ arc sec θ_Y = 210 (Y PIPA Bias) = ____________ arc sec θ_Z = 210 (Z PIPA Bias) = ____________ arc sec Line a - θ_Y = ____________ enter on line g Line b - θ_Z = ____________ enter on line h Line c - θ_X = ____________ enter on line i Line d - θ_Y = ____________ enter on line j Line e - θ_X = ____________ enter on line k Line f - θ_Z = ____________ enter on line l

DATE 30 JUN 66

JDC 12218 REV. B PAGE 1 OF 7

JOB G & N FINE ALIGN TEST

INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
(M) A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Establish a Master Initialization condition.

2. Make the following switch settings on the Indicator Control panel:

a. OPTICS MODE to ZERO

b. OPTICS SPEED to LO

c. OPTICS COUPLING TO DIRECT

d. OPTICS TRACKER to OFF

e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +135.00

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +13500 ENTR

To change only Row 2

c. VERB 22 ENTR

d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe

VERB 21 NOUN 30 Flashing

c. +00001 ENTR

d. Observe

VERB 22 NOUN 30 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 30 Flashing

g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +27000

b. Row 2 displays +00000

c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +27000 ENTR

To change only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +18000 ENTR

To change only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence

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flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR

b. +18000 ENTR

To correct only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +00000

c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR

b. + 13500 ENTR

To correct only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4

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location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 2

32. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

33. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 15 seconds then set the OPTICS MODE switch to MAN.

42. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the T PAK shaft readout. (Set the CONTROLLER SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

46. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set the CONTROLLER SPEED switch set to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set the OPTICS MODE switch to MANUAL and the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

54. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

56. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34 ENTR
b. The PROG display shall indicate 00
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR

61. Set the G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break the hoses or cables.

62. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.900
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.921

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12218 JDC
REV. B
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ____________
SER. NO. ______ DWG ______ REV. ___

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ ______ CAL DATE
NAME ____________ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			a
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			b
37	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			c
39	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			d
57	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			e
56	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12218
REV. B

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (Cont)	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12218
REV. B

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
62	Enter the latest values from JDC 12217 X PIPA Bias ________ cm/ sec^2 Y PIPA Bias ________ cm/ sec^2 Z PIPA Bias ________ cm/ sec^2 θ_X = 210 (X PIPA Bias) = ________ arc sec θ_Y = 210 (Y PIPA Bias) = ________ arc sec θ_Z = 210 (Z PIPA Bias) = ________ arc sec Line a - θ_Y = ________ enter on line g Line b - θ_Z = ________ enter on line h Line c - θ_X = ________ enter on line i Line d - θ_Y = ________ enter on line j Line e - θ_X = ________ enter on line k Line f - θ_Z = ________ enter on line l

DATE 30 JUN 66

JDC 12218 REV. C PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS 3

JOB G & N FINE ALIGN TEST

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA Misalignment Test within 0.2 hours of that time.

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Establish a Master Initialization condition.

2. Make the following switch settings on the Indicator Control panel;

a. OPTICS MODE to ZERO
b. OPTICS SPEED to LO
c. OPTICS COUPLING TO DIRECT
d. OPTICS TRACKER to OFF
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +135.00

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR
b. +13500 ENTR

To change only Row 2

c. VERB 22 ENTR
d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00001 ENTR
d. Observe
VERB 22 NOUN 30. Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR
b. +27000 ENTR

To change only Row 2

c. VERB 22 ENTR
d. +00000 ENTR

Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR
b. +18000 ENTR

To change only Row 2

c. VERB 22 ENTR
d. +00000 ENTR

Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence

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flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR
b. +18000 ENTR

To correct only Row 2

c. VERB 22 ENTR
d. +00000 ENTR

Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR
b. +13500 ENTR

To correct only Row 2

c. VERB 22 ENTR
d. +00000 ENTR

Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4

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location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 2

32. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

33. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00003		ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe		
VERB 21	NOUN 30	Flashing
c. +00002		ENTR
d. Observe		
VERB 22	NOUN 30	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 30	Flashing
g. +00001		ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 15 seconds then set the OPTICS MODE switch to MAN.

42. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. +00000		ENTR
c. +00000		ENTR
d. +00000		ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the T PAK shaft readout. (Set the CONTROLLER SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

46. Perform the following DSKY operations:

a. VERB 57	ENTR
b. 00003	ENTR

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47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe		
VERB 21	NOUN 30	Flashing
c. +00003		ENTR
d. Observe		
VERB 22	NOUN 30	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 30	Flashing
g. +00000		ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set the CONTROLLER SPEED switch set to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set the OPTICS MODE switch to MANUAL and the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

54. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics

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until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

56. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34		ENTR
b. The PROG display shall indicate 00		
c. VERB 41	NOUN 20	ENTR
d. +00000		ENTR
e. +00000		ENTR
f. +00000		ENTR

61. Set the G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break the hoses or cables.

62. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.900
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.921

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12218 JDC
REV. C
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST
TITLE ____________
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____________ SER. NO. ______ CAL DATE
NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION   APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			a
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			b
37	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			c
39	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			d
57	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			e
56	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h

FORM 0015
Chg. 7-21-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12218
REV. C

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (Cont)	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12218
REV. C

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
62	Enter the latest values from JDC 12217 X PIPA Bias ________ cm/sec^2 Y PIPA Bias ________ cm/sec^2 Z PIPA Bias ________ cm/sec^2 θ_X = 210 (X PIPA Bias) = ________ arc sec θ_Y = 210 (Y PIPA Bias) = ________ arc sec θ_Z = 210 (Z PIPA Bias) = ________ arc sec Line a - θ_Y = ________ enter on line g Line b - θ_Z = ________ enter on line h Line c - θ_X = ________ enter on line i Line d - θ_Y = ________ enter on line j Line e - θ_X = ________ enter on line k Line f - θ_Z = ________ enter on line l

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JOB G & N FINE ALIGN TEST

JDC 12218 REV. D PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-

M

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA Misalignment Test within 0.2 hours of that time.

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Establish a Master Initialization condition and press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Make the following switch settings on the Indicator Control panel:

- a. OPTICS MODE to ZERO
- b. OPTICS SPEED to LO
- c. OPTICS COUPLING TO DIRECT
- d. OPTICS TRACKER to OFF
- e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57	ENTR
b. 00003	ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +135.00

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N FINE ALIGN TEST

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SUBSYSTEM G & N SYSTEM

ASSY

b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1

a. VERB 21	ENTR
b. +13500	ENTR

To change only Row 2

c. VERB 22	ENTR
d. SITE LATITUDE	ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe		
VERB 21	NOUN 30	Flashing
c. +00001		ENTR
d. Observe		
VERB 22	NOUN 30	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 30	Flashing
g. +00001		ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

- a. Row 1 displays +27000
- b. Row 2 displays +00000
- c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:

To change only Row 1

a. VERB 21	ENTR
b. +27000	ENTR

To change only Row 2

c. VERB 22	ENTR
d. +00000	ENTR

Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

- a. Row 1 displays +18000
- b. Row 2 displays +00000
- c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:

To change only Row 1

a. VERB 21	ENTR
b. +18000	ENTR

To change only Row 2

c. VERB 22	ENTR
d. +00000	ENTR

Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence

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JOB G & N FINE ALIGN TEST

JDC 12218 REV D PAGE 3 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

flashing, insure that the DSKY displays the following:

- a. Row 1 displays +18000
- b. Row 2 displays +00000
- c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1

a. VERB 21	ENTR
b. +18000	ENTR

To correct only Row 2

c. VERB 22	ENTR
d. +00000	ENTR

Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

- a. Row 1 displays +13500
- b. Row 2 displays +00000
- c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1

a. VERB 21	ENTR
b. +13500	ENTR

To correct only Row 2

c. VERB 22	ENTR
d. +00000	ENTR

Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4

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JOB G & N FINE ALIGN TEST

JDC 12218 REV D PAGE 4 OF 7

SUBSYSTEM G & N SYSTEM

ASSY

location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

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INITIALIZATION POSITION 2

32. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

33. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00003		ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe		
VERB 21	NOUN 30	Flashing
c. +00002		ENTR
d. Observe		
VERB 22	NOUN 30	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 30	Flashing
g. +00001		ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 15 seconds then set the OPTICS MODE switch to MAN.

42. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. +00000		ENTR
c. +00000		ENTR
d. +00000		ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the T PAK shaft readout. (Set the CONTROLLER SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

46. Perform the following DSKY operations:

a. VERB 57	ENTR
b. 00003	ENTR

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47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe		
VERB 21	NOUN 30	Flashing
c. +00003		ENTR
d. Observe		
VERB 22	NOUN 30	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 30	Flashing
g. +00000		ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set the CONTROLLER SPEED switch set to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set the OPTICS MODE switch to MANUAL and the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

54. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

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56. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34		ENTR
b. The PROG display shall indicate 00		
c. VERB 41	NOUN 20	ENTR
d. +00000		ENTR
e. +00000		ENTR
f. +00000		ENTR

61. Set the G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break the hoses or cables and press OPTICS POWER ON pushbutton on the Test Control panel so that the OPTICS POWER ON pushbutton goes out.

62. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.900
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.921

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12218
REV. D
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ____

SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION

TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE ____

NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			a
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			b
37	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			c
39	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			d
57	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			e
59	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 3

JDC
NO. 12218
REV. D

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (Cont)	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 3

JDC
NO. 12218
REV. D

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
62	Enter the latest values from JDC 12217 X PIPA Bias ____________ cm/sec^2 Y PIPA Bias ____________ cm/sec^2 Z PIPA Bias ____________ cm/sec^2 θ_X = 210 (X PIPA Bias) = ____________ arc sec θ_Y = 210 (Y PIPA Bias) = ____________ arc sec θ_Z = 210 (Z PIPA Bias) = ____________ arc sec Line a - θ_Y = ____________ enter on line g Line b - θ_Z = ____________ enter on line h Line c - θ_X = ____________ enter on line i Line d - θ_Y = ____________ enter on line j Line e - θ_X = ____________ enter on line k Line f - θ_Z = ____________ enter on line l

DATE 30 JUN 66

JDC 12218 REV. E PAGE 1 OF 7

JOB G & N FINE ALIGN TEST

INITIAL TDRR 29882 **D.S. PGS** 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31943	7	-	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12204. To prevent erroneous test results, do not enter a PIPA Misalignment Test within 0.2 hours of that time.

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Establish a Master Initialization condition and press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Make the following switch settings on the Indicator Control panel:

a. OPTICS MODE to ZERO

b. OPTICS SPEED to LO

c. OPTICS COUPLING TO DIRECT

d. OPTICS TRACKER to OFF

e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +135.00

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +13500 ENTR

To change only Row 2

c. VERB 22 ENTR

d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe

VERB 21 NOUN 30 Flashing

c. +00001 ENTR

d. Observe

VERB 22 NOUN 30 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 30 Flashing

g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +27000

b. Row 2 displays +00000

c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +27000 ENTR

To change only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +18000 ENTR

To change only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence

---

flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR

b. +18000 ENTR

To correct only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +00000

c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR

b. +13500 ENTR

To correct only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4

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location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 2

32. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

33. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
   VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe
   VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
   VERB 23 NOUN 30 Flashing
g. +00001 ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 15 seconds then set the OPTICS MODE switch to MAN.

42. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the T PAK shaft readout. (Set the CONTROLLER SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

46. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

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47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
   VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe
   VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
   VERB 23 NOUN 30 Flashing
g. +00000 ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set the CONTROLLER SPEED switch set to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set the OPTICS MODE switch to MANUAL and the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

54. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics

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until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

56. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34 ENTR
b. The PROG display shall indicate 00
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR

61. Set the G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break the hoses or cables and press OPTICS POWER ON pushbutton on the Test Control panel so that the OPTICS POWER ON pushbutton goes out.

62. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.902
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.921

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12218
REV. E
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			a
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			b
37	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			c
39	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			d
57	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			e
59	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12218
REV. E

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (Cont)	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12218
REV. E

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
62	Enter the latest values from JDC 12217 X PIPA Bias ______ cm/sec^2 Y PIPA Bias ______ cm/sec^2 Z PIPA Bias ______ cm/sec^2 θ_X = 210 (X PIPA Bias) = ______ arc sec θ_Y = 210 (Y PIPA Bias) = ______ arc sec θ_Z = 210 (Z PIPA Bias) = ______ arc sec Line a - θ_Y = ______ enter on line g Line b - θ_Z = ______ enter on line h Line c - θ_X = ______ enter on line i Line d - θ_Y = ______ enter on line j Line e - θ_X = ______ enter on line k Line f - θ_Z = ______ enter on line l

DATE 30 JUN 66

JOB G & N FINE ALIGN TEST

JDC 12218 REV. F PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31943	7	-	EA	-
F	4-5-67	33491	1,5	1	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: To prevent erroneous test results, complete each test position within 25 minutes after entering that position.

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Establish a Master Initialization condition and press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Make the following switch settings on the Indicator Control panel:

a. OPTICS MODE to ZERO
b. OPTICS SPEED to LO
c. OPTICS COUPLING TO DIRECT
d. OPTICS TRACKER to OFF
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

2A. Perform the following DSKY operations:

VERB 01	NOUN 10	ENTR
00003		ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

Record Row 1 indication. If the recorded value is within any of the sets of limits given on the data sheet proceed with the test. If the recorded value is not within any of the sets of limits wait 30 minutes and then repeat this step.

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +135.00
b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1
a. VERB 21 ENTR
b. +13500 ENTR
To change only Row 2
c. VERB 22 ENTR
d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00001 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:

To change only Row 1
a. VERB 21 ENTR
b. +27000 ENTR
To change only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:

To change only Row 1
a. VERB 21 ENTR
b. +18000 ENTR

To change only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR
b. +18000 ENTR
To correct only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR
b. +13500 ENTR
To correct only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4

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location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 2

32. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

32A. Repeat step 2A.

33. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00003		ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe		
VERB 21	NOUN 30	Flashing
c. +00002		ENTR
d. Observe		
VERB 22	NOUN 30	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 30	Flashing
g. +00001		ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 15 seconds then set the OPTICS MODE switch to MAN.

42. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. +00000		ENTR
c. +00000		ENTR
d. +00000		ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the T PAK shaft readout. (Set the CONTROLLER SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

45A. Repeat step 2A.

46. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00003		ENTR

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47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe		
VERB 21	NOUN 30	Flashing
c. +00003		ENTR
d. Observe		
VERB 22	NOUN 30	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 30	Flashing
g. +00000		ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set the CONTROLLER SPEED switch set to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set the OPTICS MODE switch to MANUAL and the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

54. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

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56. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34		ENTR
b. The PROG display shall indicate 00		
c. VERB 41	NOUN 20	ENTR
d. +00000		ENTR
e. +00000		ENTR
f. +00000		ENTR

61. Set the G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break the hoses or cables and press OPTICS POWER ON pushbutton on the Test Control panel so that the OPTICS POWER ON pushbutton goes out.

62. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.902
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.921

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12218 JDC
REV. F
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION
APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2A	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242	▨	▨
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨		
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨		
32A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000		03242 07242 13242 17242 23242	▨	▨

a

b

FORM 00146
Chg. 7-13-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12218
REV. F

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
32A (2A) (cont)			24000 30000 34000		27242 33242 37242	▨	▨	
37	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			c
39	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			d
45A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242	▨	▨	
57	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			e
59	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12218
REV. F

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (cont)	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC NO. 12218
REV. F

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
62	Enter the latest values from JDC 12217

X PIPA Bias __________ cm/sec^2
Y PIPA Bias __________ cm/sec^2
Z PIPA Bias __________ cm/sec^2

θ_X = 210 (X PIPA Bias) = __________ arc sec
θ_Y = 210 (Y PIPA Bias) = __________ arc sec
θ_Z = 210 (Z PIPA Bias) = __________ arc sec

Line a - θ_Y = __________ enter on line g
Line b - θ_Z = __________ enter on line h
Line c - θ_X = __________ enter on line i
Line d - θ_Y = __________ enter on line j
Line e - θ_X = __________ enter on line k
Line f - θ_Z = __________ enter on line l

DATE 30 JUN 66

JOB G & N FINE ALIGN TEST

JDC 12218 REV. G PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM
ASSY.
DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30303	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31943	7	-	EA	-
F	4-5-67	33491	1,5	1	EA	-
G	9-6-67	34560	1	-	EA	-

REFERENCES

IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: within 25 minutes after entering that position.
2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Establish a Master Initialization condition and press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Make the following switch settings on the Indicator Control panel:

a. OPTICS MODE to ZERO
b. OPTICS SPEED to LO
c. OPTICS COUPLING TO DIRECT
d. OPTICS TRACKER to OFF
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

2A. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

Record Row 1 indication. If the recorded value is within any of the sets of limits given on the data sheet proceed with the test. If the recorded value is not within any of the sets of limits wait 30 minutes and then repeat this step.

TEST ENTRY

3. Perform the following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +135.00
b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:
To change only Row 1
a. VERB 21 ENTR
b. +13500 ENTR
To change only Row 2
c. VERB 22 ENTR
d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:
a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00001 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:
To change only Row 1
a. VERB 21 ENTR
b. +27000 ENTR
To change only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:
To change only Row 1
a. VERB 21 ENTR
b. +18000 ENTR

To change only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1
a. VERB 21 ENTR
b. +18000 ENTR
To correct only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays -13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1
a. VERB 21 ENTR
b. +13500 ENTR
To correct only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4

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location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 2

32. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

32A. Repeat step 2A.

33. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21' NOUN 30 Flashing
c. +00002 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 15 seconds then set the OPTICS MODE switch to MAN.

42. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the T PAK shaft readout. (Set the CONTROLLER SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

45A. Repeat step 2A.

46. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

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47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set the CONTROLLER SPEED switch set to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set the OPTICS MODE switch to MANUAL and the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

54. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics

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until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

56. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34 ENTR
b. The PROG display shall indicate 00
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR

61. Set the G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break the hoses or cables and press OPTICS POWER ON pushbutton on the Test Control panel so that the OPTICS POWER ON pushbutton goes out.

62. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.902
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.921

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12218 JDC
REV. G
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2A	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242	▨	▨	
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			a
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			b
32A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000		03242 07242 13242 17242 23242	▨	▨	

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12218
REV G

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
32A (2A) (cont)			24000 30000 34000		27242 33242 37242			
37	X PIPA about Y misalignment	arc sec		R1 R2 ( )____.____				c
39	Y PIPA about X misalignment	arc sec		R1 R2 ( )____.____				d
45A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242			
57	X PIPA about Z misalignment	arc sec		R1 R2 ( )____.____				e
59	Z PIPA about X misalignment	arc sec		R1 R2 ( )____.____				f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12218
REV G

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (cont)	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC NO. 12218
REV G

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
62	Enter the latest values from JDC 12217 X PIPA Bias ________ cm/sec^2 Y PIPA Bias ________ cm/sec^2 Z PIPA Bias ________ cm/sec^2 θ_X = 210 (X PIPA Bias) = ________ arc sec θ_Y = 210 (Y PIPA Bias) = ________ arc sec θ_Z = 210 (Z PIPA Bias) = ________ arc sec Line a - θ_Y = ________ enter on line g Line b - θ_Z = ________ enter on line h Line c - θ_X = ________ enter on line i Line d - θ_Y = ________ enter on line j Line e - θ_X = ________ enter on line k Line f - θ_Z = ________ enter on line l

DATE 30 JUN 66

JOB G & N FINE ALIGN TEST | JDC 12218 REV. H PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM | ASSY.
DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	7-28-66	30309	6,7	-	EA	WS	
B	9-1-66	30927	7	-	JP	-	
C	10-20-66	31615	1	-	EA	-	IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below).
D	11-10-66	31897	1,7	1	EA	-	
E	11-15-66	31943	7	-	EA	-	
F	4-5-67	33491	1,5	1	EA	-	INTERVAL
G	9-6-67	34560	1	-	EA	-	
H	9-14-67	34610	1,3,4	-	EA	-	TOOLS AND MATERIAL

IMPORTANT: within 25 minutes after entering that position.
2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Establish a Master Initialization condition and press OPTICS POWER ON pushbutton on Test Control panel and the OPTICS POWER ON pushbutton shall light.

2. Make the following switch settings on the Indicator Control panel:
- a. OPTICS MODE to MAN, and then to ZERO
- b. OPTICS SPEED to LO
- c. OPTICS COUPLING to DIRECT
- d. OPTICS TRACKER to OFF
- e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

2A. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

Record Row 1 indication. If the recorded value is within any of the sets of limits given on the data sheet proceed with the test. If the recorded value is not within any of the sets of limits wait 30 minutes and then repeat this step.

TEST ENTRY

3. Perform the following DSKY operations:
- a. VERB 57 ENTR
- b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
- a. Row 1 displays +135.00
- b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1
- a. VERB 21 ENTR
- b. +13500. ENTR

To change only Row 2
- c. VERB 22 ENTR
- d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:
- a. VERB 33 ENTR
- b. Observe
  VERB 21 NOUN 30 Flashing
- c. +00001 ENTR
- d. Observe
  VERB 22 NOUN 30 Flashing
- e. +00000 ENTR
- f. Observe
  VERB 23 NOUN 30 Flashing
- g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
- a. Row 1 displays +27000
- b. Row 2 displays +00000
- c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:

To change only Row 1
- a. VERB 21 ENTR
- b. +27000 ENTR

To change only Row 2
- c. VERB 22 ENTR
- d. +00000 ENTR

Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
- a. Row 1 displays +18000
- b. Row 2 displays +00000
- c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:

To change only Row 1
- a. VERB 21 ENTR
- b. +18000 ENTR

To change only Row 2
- c. VERB 22 ENTR
- d. +00000 ENTR

Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
- a. Row 1 displays +18000
- b. Row 2 displays +00000
- c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1
- a. VERB 21 ENTR
- b. +18000 ENTR

To correct only Row 2
- c. VERB 22 ENTR
- d. +00000 ENTR

Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
- a. Row 1 displays +13500
- b. Row 2 displays +00000
- c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1
- a. VERB 21 ENTR
- b. +13500 ENTR

To correct only Row 2
- c. VERB 22 ENTR
- d. +00000 ENTR

Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until the optics stop driving before proceeding.

---

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in step 25 and step 27.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 2

32. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

32A. Repeat step 2A.

33. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 15 seconds then set the OPTICS MODE switch to MAN.

42. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the T PAK shaft readout. (Set the CONTROLLER SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

45A. Repeat step 2A.

46. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

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47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set the CONTROLLER SPEED switch set to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set the OPTICS MODE switch to MANUAL and the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

54. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

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56. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34 ENTR
b. The PROG display shall indicate 00
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR

61. Set the G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break the hoses or cables and press OPTICS POWER ON pushbutton on the Test Control panel so that the OPTICS POWER ON pushbutton goes out.

62. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.902
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.921

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12218 JDC
REV. H
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2A	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242	▨	▨	
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____ . ____	▨			a
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____ . ____	▨			b
32A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000		03242 07242 13242 17242 23242	▨	▨	

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12218
REV. H

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
32A (2A) (cont)			24000 30000 34000		27242 33242 37242	▨	▨	
37	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____·____	▨			c
39	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____·____	▨			d
45A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242	▨	▨	
57	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____·____	▨			e
59	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____·____	▨			f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12218
REV. H

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (cont)	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12218
REV. H

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
62	Enter the latest values from JDC 12217

X PIPA Bias ____________ cm/sec^2
Y PIPA Bias ____________ cm/sec^2
Z PIPA Bias ____________ cm/sec^2

θ_X = 210 (X PIPA Bias) = ____________ arc sec
θ_Y = 210 (Y PIPA Bias) = ____________ arc sec
θ_Z = 210 (Z PIPA Bias) = ____________ arc sec

Line a - θ_Y = ____________ enter on line g
Line b - θ_Z = ____________ enter on line h
Line c - θ_X = ____________ enter on line i
Line d - θ_Y = ____________ enter on line j
Line e - θ_X = ____________ enter on line k
Line f - θ_Z = ____________ enter on line l

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JOB G & N FINE ALIGN TEST

JDC 12218 REV. J PAGE 1 OF 8
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SUBSYSTEM G & N SYSTEM
ASSY.
DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31943	7	-	EA	-
F	4-5-67	33491	1,5	1	EA	-
G	9-6-67	34560	1	-	EA	-
H	9-14-67	34610	1,3,4	-	EA	-
J	10-12-67	34831	1,3,5,6,7	4	EA	-

REFERENCES

IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: within 25 minutes after entering that position.
2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to DIRECT
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM [illegible]
Chg. 3-[illegible]

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b. On all Indicator Control panels except 2021290 set
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to DIRECT
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

2A. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record Row 1 indication. If the recorded value is within any of the sets of limits given on the data sheet proceed with the test. If the recorded value is not within any of the sets of limits wait 30 minutes and then repeat this step.

TEST ENTRY

3. Perform the following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +135.00
b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:
To change only Row 1
a. VERB 21 ENTR
b. +13500 ENTR
To change only Row 2
c. VERB 22 ENTR
d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:
a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00001 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:
To change only Row 1
a. VERB 21 ENTR
b. +27000 ENTR

To change only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:
To change only Row 1
a. VERB 21 ENTR
b. +18000 ENTR
To change only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1
a. VERB 21 ENTR
b. +18000 ENTR
To correct only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1
a. VERB 21 ENTR
b. +13500 ENTR
To correct only Row 2
c. VERB 22 ENTR
d. +00000 ENTR
Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

---

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel.
If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.
If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in step 25 and step 27.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT

central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 2

32. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

32A. Repeat step 2A.

33. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
   VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe
   VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
   VERB 23 NOUN 30 Flashing
g. +00001 ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

---

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

42. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the TPAC shaft readout. (Set the OPTICS SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

45A. Repeat step 2A.

46. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
   VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe
   VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
   VERB 23 NOUN 30 Flashing
g. +00000 ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set OPTICS SPEED switch on Indicator Control panel to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set OPTICS SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

---

52. Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the OPTICS SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

54. Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the OPTICS SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

56. Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34 ENTR
b. The PROG display shall indicate 00
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR

61. Set G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break hoses or cables.

---

62. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

63. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.902
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.921

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12218
REV. J
INITIAL TDRR 29P 2

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ____________________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________________ SER. NO. ________ ________ CAL DATE

NAME ____________________ SER. NO. ________ ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2A	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242	▨	▨	
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			a
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			b
32A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000		03242 07242 13242 17242 23242	▨	▨	

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FORM [illegible]
Clg. 7-[illegible]

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
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JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
32A (2A) (cont)			24000 30000 34000		27242 33242 37242	▨	▨	
37	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			c
39	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			d
45A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242	▨	▨	
57	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			e
59	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12218
REV. ___

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (cont)	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12218
REV. J

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
63	Enter the latest values from JDC 12217 X PIPA Bias ________ cm/sec^2 Y PIPA Bias ________ cm/sec^2 Z PIPA Bias ________ cm/sec^2 θ_X = 210 (X PIPA Bias) = ________ arc sec θ_Y = 210 (Y PIPA Bias) = ________ arc sec θ_Z = 210 (Z PIPA Bias) = ________ arc sec Line a - θ_Y = ________ enter on line g Line b - θ_Z = ________ enter on line h Line c - θ_X = ________ enter on line i Line d - θ_Y = ________ enter on line j Line e - θ_X = ________ enter on line k Line f - θ_Z = ________ enter on line l

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JOB G & N FINE ALIGN TEST | JDC 12218 REV. K PAGE 1 OF 8 | INITIAL TDRR 29882 D.S. PGS. 4

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	7-28-66	30303	6,7	-	EA	WS	
B	9-1-66	30927	7	-	JP	-	
C	10-20-66	31615	1	-	EA	-	IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)
D	11-10-66	31897	1,7	1	EA	-	
E	11-15-66	31943	7	-	EA	-	
F	4-5-67	33491	1,5	1	EA	-	INTERVAL
G	9-6-67	34560	1	-	EA	-	
H	9-14-67	34610	1,3,4	-	EA	-	TOOLS AND MATERIAL
J	10-12-67	34831	1,3,5,6,7	4	EA	-	
K	1-4-68	35362	1,7	-	EA	-	

IMPORTANT: within 25 minutes after entering that position. 2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops. 3. Insure that cable W226 is removed and connector assembly (2003009) is connected to CGC test connector.

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set

(1) OPTICS ZERO to OFF then to ZERO

(2) OPTICS TEL TRUN to SLAVE TO SXT

(3) OPTICS COUPLING to DIRECT

(4) OPTICS MODE to MAN

(5) OPTICS SPEED to LO

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N FINE ALIGN TEST | JDC 12218 REV K PAGE 2 OF 8

SUBSYSTEM G & N SYSTEM | ASSY

b. On all Indicator Control panels except 2021290 set

(1) OPTICS MODE to MAN then to ZERO

(2) OPTICS CONTROLLER SPEED to LO

(3) OPTICS CONTROLLER COUPLING to DIRECT

(4) OPTICS TRACKER to OFF

(5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

2A. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR

00003 ENTR

Record Row 1 indication. If the recorded value is within any of the sets of limits given on the data sheet proceed with the test. If the recorded value is not within any of the sets of limits wait 30 minutes and then repeat this step.

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +135.00

b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +13500 ENTR

To change only Row 2

c. VERB 22 ENTR

d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe

VERB 21 NOUN 30 Flashing

c. +00001 ENTR

d. Observe

VERB 22 NOUN 30 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 30 Flashing

g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +27000

b. Row 2 displays +00000

c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +27000 ENTR

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JOB G & N FINE ALIGN TEST | JDC 12218 REV K PAGE 3 OF 8

SUBSYSTEM G & N SYSTEM | ASSY

To change only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:

To change only Row 1

a. VERB 21 ENTR

b. +18000 ENTR

To change only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR

b. +18000 ENTR

To correct only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +00000

c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1

a. VERB 21 ENTR

b. + 13500 ENTR

To correct only Row 2

c. VERB 22 ENTR

d. +00000 ENTR

Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set OPTICS ZERO switch (on Indicator Control panel 2021290 only)

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JOB G & N FINE ALIGN TEST | JDC 12218 REV K PAGE 4 OF 8

SUBSYSTEM G & N SYSTEM | ASSY

to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in step 25 and step 27.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT

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central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 2

32. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

32A. Repeat step 2A.

33. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

42. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the TPAC shaft readout. (Set the OPTICS SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

45A. Repeat step 2A.

46. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set OPTICS SPEED switch on Indicator Control panel to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set OPTICS SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the OPTICS SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

NOTE: Minimize the time between MARKS taken in step 54 and step 56.

54. Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the OPTICS SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

56. Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34 ENTR
b. The PROG display shall indicate 00
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR

61. Set G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break hoses or cables.

62. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

63. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.902
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.921

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12218
REV. K
INITIAL TDRR 2988

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2A	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242	▨	▨	
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			a
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			b
32A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000		03242 07242 13242 17242 23242	▨	▨	

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12218
REV. K

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
32A (2A) (cont)			24000 30000 34000		27242 33242 37242	▨	▨	
37	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			c
39	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			d
45A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242	▨	▨	
57	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			e
59	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 122 8
REV. K

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (cont)	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12218
REV. K

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
63	Enter the latest values from JDC 12217

X PIPA Bias ______ cm/sec^2
Y PIPA Bias ______ cm/sec^2
Z PIPA Bias ______ cm/sec^2

θ_X = 210 (X PIPA Bias) = ______ arc sec
θ_Y = 210 (Y PIPA Bias) = ______ arc sec
θ_Z = 210 (Z PIPA Bias) = ______ arc sec

Line a - θ_Y = ______ enter on line g
Line b - θ_Z = ______ enter on line h
Line c - θ_X = ______ enter on line i
Line d - θ_Y = ______ enter on line j
Line e - θ_X = ______ enter on line k
Line f - θ_Z = ______ enter on line l

DATE 30 JUN 66

JOB G & N FINE ALIGN TEST | **JDC** 12218 **REV.** L **PAGE** 1 **OF** 8
INITIAL TDRR 29882 **D.S. PGS** 4

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31943	7	-	EA	-
F	4-5-67	33491	1,5	1	EA	-
G	9-6-67	34560	1	-	EA	-
H	9-14-67	34610	1,3,4	-	EA	-
J	10-12-67	34831	1,3,5,6,7	4	EA	-
K	1-4-68	35362	1,7	-	EA	-
L	2-1-68	35549	7	-	EA	-

REFERENCES

IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: within 25 minutes after entering that position. 2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops. 3. Insure that cable W226 is removed and connector assembly (2003009) is connected to CGC test connector.

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Perform the following switch settings on the applicable Indicator Control panel.

a. On Indicator Control panel 2021290 only set
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to DIRECT
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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b. On all Indicator Control panels except 2021290 set
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to DIRECT
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

2A. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record Row 1 indication. If the recorded value is within any of the sets of limits given on the data sheet proceed with the test. If the recorded value is not within any of the sets of limits wait 30 minutes and then repeat this step.

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +135.00
b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1
a. VERB 21 ENTR
b. +13500 ENTR
To change only Row 2
c. VERB 22 ENTR
d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00001 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:

To change only Row 1
a. VERB 21 ENTR
b. +27000 ENTR

To change only Row 2
c. VERB 22 ENTR
d. +00000 ENTR

Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:

To change only Row 1
a. VERB 21 ENTR
b. +18000 ENTR
To change only Row 2
c. VERB 22 ENTR
d. +00000 ENTR

Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1
a. VERB 21 ENTR
b. +18000 ENTR
To correct only Row 2
c. VERB 22 ENTR
d. +00000 ENTR

Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1
a. VERB 21 ENTR
b. +13500 ENTR
To correct only Row 2
c. VERB 22 ENTR
d. +00000 ENTR

Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

---

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in step 25 and step 27.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT

central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 2

32. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

32A. Repeat step 2A.

33. Perform the following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:
a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

42. Perform the following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the TPAC shaft readout. (Set the OPTICS SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

45A. Repeat step 2A.

46. Perform the following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:
a. VERB 33 ENTR
b. Observe
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set OPTICS SPEED switch on Indicator Control panel to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set OPTICS SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the OPTICS SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

NOTE: Minimize the time between MARKS taken in step 54 and step 56.

54. Set the OPTICS SPEED switch to LO. Using Optics Hand Controller, drive optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the OPTICS SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

56. Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #3. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57. If not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:
a. VERB 34 ENTR
b. The PROG display shall indicate 00
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR

61. Set G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break hoses or cables.

62. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

63. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.902
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.921

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 4

JDC
NO. 12218
REV. L
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2A	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242			
28	Y PIPA about Z misalignment	arc sec		R1 R2 ( )____.____				a
30	Z PIPA about Y misalignment	arc sec		R1 R2 ( )____.____				b
32A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000		03242 07242 13242 17242 23242			

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 4

JDC
NO. 12218
REV. L

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
32A (2A) (cont)			24000 30000 34000		27242 33242 37242			
37	X PIPA about Y misalignment	arc sec		R1 R2 ( )____.____				c
39	Y PIPA about X misalignment	arc sec		R1 R2 ( )____.____				d
45A (2A)	Row 1 indication	time bits	00000 04000 10000 14000 20000 24000 30000 34000		03242 07242 13242 17242 23242 27242 33242 37242			
57	X PIPA about Z misalignment	arc sec		R1 R2 ( )____.____				e
59	Z PIPA about X misalignment	arc sec		R1 R2 ( )____.____				f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 4

JDC
NO. 12218
REV. L

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (cont)	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 4

JDC
NO. 12218
REV. L

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
63	Enter the latest values from JDC 12217 X PIPA Bias ______ cm/sec^2 Y PIPA Bias ______ cm/sec^2 Z PIPA Bias ______ cm/sec^2 θ_X = 210 (X PIPA Bias) = ______ arc sec θ_Y = 210 (Y PIPA Bias) = ______ arc sec θ_Z = 210 (Z PIPA Bias) = ______ arc sec Line a - θ_Y = ______ enter on line g Line b - θ_Z = ______ enter on line h Line c - θ_X = ______ enter on line i Line d - θ_Y = ______ enter on line j Line e - θ_X = ______ enter on line k Line f - θ_Z = ______ enter on line l

DATE 30 JUN 66

JOB G & N FINE ALIGN TEST

JDC 12218 REV. M PAGE 1 OF 46

INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars). The SXT measures (cont)

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31943	7	-	EA	-
F	4-5-67	33491	1,5	1	EA	-
G	9-6-67	34560	1	-	EA	-
H	9-14-67	34610	1,3,4	-	EA	-
J	10-12-67	34831	1,3,5,6,7	4	EA	-
K	1-4-68	35362	1,7	-	EA	-
L	2-1-68	35549	7	-	EA	-
M	8-7-68	36673	All	All	EA	-

REFERENCES

IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont): star angles with respect to Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment.

The X and Z Stable Member axis are in turn aligned to local vertical.

IMPORTANT: 1. To prevent erroneous test results, complete each test position with 25 minutes after entering that position.

2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

3. Insure that cable W226 is removed and connector assembly (2003099 is connected to CGC test connector.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

NOTE: 1. This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

DATE ________

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to RSLV
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to RSLV
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12218 CTS UPLINK Tape, P/N 2901648

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to RSLV
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to RSLV
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

DATE ________

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

(B) Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

(C) Set digit switches on Self Test Assembly to 00000.

(D) Self Test panel -
Press to light SELF TEST pushbutton.

(E) Tape Reader -
Set Power switch to ON.
Load the CTS UPLINK tape.
If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

DATE ________

MANUAL LOAD PROCEDURES

4. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

(F) Programmer and Monitor panel -
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(G) RDC Interface panel -
Press to light CH33-10 pushbutton.

(H) XY Interface panel -
Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons.
Set AGC INPUT COUNTERS switch to 9.

(I) Programmer and Monitor panel -
Press EXECUTE push-button. Verify that tape advances to beginning of first UPLINK code.
Press EXECUTE pushbutton.

4. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then perform the following operations:

a. Reload UPLINK tape in Tape Reader at beginning of tape.

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 1

5. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

6. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 7, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 1 ENTRY

7. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00001 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

b. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that tape advances to beginning of first UPLINK code.
c. Press EXECUTE pushbutton on Programmer and Monitor panel.
d. Repeat step 4.

INITIALIZATION POSITION 1

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

6. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

6A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 1 ENTRY

7. Press EXECUTE pushbutton on Programmer and Monitor panel.

7A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

8. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 9, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

9. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

10. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 11, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

7B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

7C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

8. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

9. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

10. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

11. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

12. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays _00000
c. Row 3 displays 00001

If displays are correct, proceed to step 13, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001

13. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

14. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 15,

CTS UPLINK TAPE LOAD PROCEDURES

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

12. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

14. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
If not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00002	
15. Enter VERB 33 and press ENTR pushbutton on DSKY.	15. Press EXECUTE pushbutton on Programmer and Monitor panel.
COARSE MARK STAR 1	COARSE MARK STAR 1
16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.	16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.
17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.	17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.
COARSE MARK STAR 2	COARSE MARK STAR 2
18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically	18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
align the SXT to target #4 location. Wait until optics stop driving before proceeding.	align the SXT to target #4 location. Wait until optics stop driving before proceeding.
19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not press MARK REJECT pushbutton and repeat this step.	19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.
FINE MARK STAR 1	FINE MARK STAR 1
20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding. NOTE: Minimize the time between MARKS taken in steps 21 and 23.	20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding. NOTE: Minimize the time between MARKS taken in steps 21 and 23.
21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press	21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
MARK REJECT pushbutton and repeat this step.	MARK REJECT pushbutton and repeat this step.
FINE MARK STAR 2	FINE MARK STAR 2
22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.	22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.
23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.	23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.
Y PIPA ABOUT Z MISALIGNMENT	Y PIPA ABOUT Z MISALIGNMENT
24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.	24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.
25. Enter VERB 33 and press ENTR pushbutton on DSKY.	25. Press EXECUTE pushbutton on Programmer and Monitor panel.
Z PIPA ABOUT Y MISALIGNMENT	Z PIPA ABOUT Y MISALIGNMENT
26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.	26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.
27. Enter VERB 34 and press ENTR pushbutton on DSKY.	27. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
INITIALIZATION POSITION 2	INITIALIZATION POSITION 2
28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.	28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI and LO as required.
29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.	29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.
30. Perform following DSKY operations: a. VERB 01 NOUN 10 ENTR b. 00003 ENTR Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.	30. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations: a. VERB 01 NOUN 10 ENTR b. 00003 ENTR
31. Perform following DSKY operations: a. VERB 57 ENTR b. 00003 ENTR	31. Press EXECUTE pushbutton on Programmer and Monitor panel.
32. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +XX.XXX (Test site latitude from Table 1) If displays are correct, proceed to step 33, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR	32. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. VERB 22 shall be flashing 32A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 2 ENTRY

33. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 35, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

35. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TEST POSITION 2 ENTRY

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

33A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

35. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 37, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

37. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 39, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001

CTS UPLINK TAPE LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

37. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

MANUAL LOAD PROCEDURES

39. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 41, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

41. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

CTS UPLINK TAPE LOAD PROCEDURES

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

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MANUAL LOAD PROCEDURES

conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

CTS UPLINK TAPE LOAD PROCEDURES

conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

MANUAL LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving bevore proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

DATE ______

MANUAL LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

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MANUAL LOAD PROCEDURES

57. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00001 ENTR ENTR
d. 02543 ENTR
e. 00002 ENTR

TEST ENTRY

58. Perform following DSKY operations:

a. VERB 47 ENTR
b. 00003 ENTR

59. When VERB 06 NOUN 61 flash, insure that the DSKY displays on the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 60, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 4 ENTRY

60. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

57. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row shall display +13500
b. VERB 22 shall be flashing

59A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 4 ENTRY

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

60A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

60B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

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MANUAL LOAD PROCEDURES

f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 62, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

62. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 64, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR

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60C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

62. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002

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MANUAL LOAD PROCEDURES

Row 3 shall display 00002.

64. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

65. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001.

66. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

67. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +22500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00002.

68. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

69. When VERB 06 NOUN 61 flash, insure that the DSKY displays on the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 70,

CTS UPLINK TAPE LOAD PROCEDURES

64. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

65. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

66. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

67. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

68. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

69. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

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MANUAL LOAD PROCEDURES

if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

70. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

71. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 72, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

72. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

CTS UPLINK TAPE LOAD PROCEDURES

70. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

71. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

72. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

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MANUAL LOAD PROCEDURES

automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

77. The Stable Member will be coarse aligned to the desired test position. In

CTS UPLINK TAPE LOAD PROCEDURES

automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

7. The Stable Member will be coarse aligned to the desired test position. In

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MANUAL LOAD PROCEDURES

approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 78 and 80.

78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press

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approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 78 and 80.

78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press

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MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value

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MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value is not within any set of limits, wait 30

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MANUAL LOAD PROCEDURES

is not within any set of limits, wait 30 minutes and then repeat this step.

88. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00000 ENTR ENTR
d. 02543 ENTR
e. 00001 ENTR

TEST ENTRY

89. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

90. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX. XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 91, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 5 ENTRY

91. Perform following DSKY operations:

a. VERB 33 ENTR

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minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

88. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

89. Press EXECUTE pushbutton on Programmer and Monitor panel.

90. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

90A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 5 ENTRY

91. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 93, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

93. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

CTS UPLINK TAPE LOAD PROCEDURES

91A. When VERB 21 NOUN 30 flash press EXECUTE pushbutton on Programmer and Monitor panel.

91B. When VERB 22 NOUN 30 flash press EXECUTE pushbutton on Programmer and Monitor panel.

91C. When VERB 23 NOUN 30 flash press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

93. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000

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MANUAL LOAD PROCEDURES

If displays are correct, proceed to step 95, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

95. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001

97. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +00000 ENTR
c. VERB 22 ENTR
d. +89999 ENTR
e. Observe:
Row 3 displays 00002.

99. Enter VERB 33 and press ENTR pushbutton on DSKY.

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b. Row 2 shall display +00000
c. Row 3 shall display 00002

95. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

97. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

99. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 101, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

101. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 103, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

101. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

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MANUAL LOAD PROCEDURES

103. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are

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103. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are

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satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

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optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

DATE ________

MANUAL LOAD PROCEDURES

118. Perform following DSKY operations:

a. VERB 40 NOUN 20 ENTR

Wait 5 seconds

b. VERB 41 NOUN 20 ENTR

c. Observe:

VERB 21 NOUN 22 Flashing

d. +00000 ENTR

e. Observe:

VERB 22 NOUN 22 Flashing

f. +00000 ENTR

g. Observe:

VERB 23 NOUN 22 Flashing

h. +00000 ENTR

119. Set the G & N Mounting Fixture tile axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required). Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00003 ENTR

Record Row 1 indications. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

118. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with step 123. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR

DATE ________

MANUAL LOAD PROCEDURES

123. Perform following DSKY operations:

a. VERB 57 ENTR

b. 00003 ENTR

124. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 125, if not, perform following DSKY operations:

To correct only Row 1:

VERB 21 ENTR

+13500 ENTR

To correct only Row 2:

VERB 22 ENTR

Site latitude from Table 1 ENTR

TEST POSITION 3 ENTRY

125. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:

VERB 21 NOUN 30 Flashing

c. +00003 ENTR

d. Observe:

VERB 22 NOUN 30 Flashing

e. +00000 ENTR

f. Observe:

VERB 23 NOUN 30 Flashing

g. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

b. 00003 ENTR

123. Press EXECUTE pushbutton on Programmer and Monitor panel.

124. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500

b. VERB 22 shall be flashing

124A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 3 ENTRY

125. Press EXECUTE pushbutton on Programmer and Monitor panel.

125A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00001

If displays are correct, proceed to step 127, if not, perform following DSKY operations:

To correct only Row 1:

VERB 21 ENTR

+18000 ENTR

To correct only Row 2:

VERB 22 ENTR

+00000 ENTR

Row 3 shall display 00001.

127. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +00000

c. Row 3 displays 00002

If displays are correct, proceed to step 129, if not perform following DSKY operations:

To correct only Row 1:

VERB 21 ENTR

+13500 ENTR

To correct only Row 2:

VERB 22 ENTR

+00000 ENTR

Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000

b. Row 2 shall display +00000

c. Row 3 shall display 00001.

127. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500

b. Row 2 shall display +00000

c. Row 3 shall display 00002.

DATE ________

MANUAL LOAD PROCEDURES

129. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set

CTS UPLINK TAPE LOAD PROCEDURES

129. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set

DATE ________

MANUAL LOAD PROCEDURES

OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0° respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

MANUAL LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Perform following DSKY operations:

a. VERB 34 ENTR
b. VERB 57 ENTR
c. 00015 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00362 ENTR
f. 16002 ENTR
g. VERB 25 NOUN 01 ENTR
h. 03770 ENTR
i. 10067 ENTR
j. 04317 ENTR
k. 01770 ENTR
l. VERB 25 NOUN 26 ENTR
m. 01000 ENTR
n. 01770 ENTR
o. 00007 ENTR
p. VERB 30 ENTR

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

MANUAL LOAD PROCEDURES

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to MAN. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

144. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02444 ENTR
c. 20000 ENTR ENTR
d. 02456 ENTR
e. 57777 ENTR ENTR
f. 02457 ENTR
g. 77777 ENTR ENTR
h. 02462 ENTR
i. 20000 ENTR ENTR
j. 02543 ENTR
k. 00002 ENTR

TEST ENTRY

145. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to MAN. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

144. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

145. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

146. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 147, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 6 ENTRY

147. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00004 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

148. When VERB 21 NOUN 22 flash, perform following DSKY operations:

a. +27000 ENTR
b. Observe:
VERB 22 NOUN 22 Flashing
c. +31500 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

146. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

146A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 6 ENTRY

147. Press EXECUTE pushbutton on Programmer and Monitor panel.

147A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

148. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

148A. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

d. Observe:
VERB 23 NOUN 22 Flashing
e. +27000 ENTR

TARGET 1 DATA INSERTION

149. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 150, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

150. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

151. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 152, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

148B. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

149. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

150. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

151. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

MANUAL LOAD PROCEDURES

Row 3 shall display 00002.

152. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line

CTS UPLINK TAPE LOAD PROCEDURES

152. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line

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MANUAL LOAD PROCEDURES

and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 158 and 160.

158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

CTS UPLINK TAPE LOAD PROCEDURES

and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 158 and 160.

158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

MANUAL LOAD PROCEDURES

160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

162. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

164. Perform following DSKY operations:
a. VERB 34 ENTR
b. Observe:
PROG display indicates 00
c. VERB 40 NOUN 20 ENTR
Wait 5 seconds
d. VERB 41 NOUN 20 ENTR
e. Observe:
VERB 21 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 22 NOUN 22 Flashing

CTS UPLINK TAPE LOAD PROCEDURES

160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

162. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

164. Press EXECUTE pushbutton on Programmer and Monitor panel. The PROG display on the DSKY shall indicate 00.

164A. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

164B. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164C. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

h. +00000 ENTR

i. Observe:

q VERB 23 NOUN 22 Flashing

j. +00000 ENTR

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

CTS UPLINK TAPE LOAD PROCEDURES

164D. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

168. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Press to extinguish AGC INPUT-CTR and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

171. Set Power switch on Tape Reader to OFF and remove tape.

172. Press to extinguish SELF TEST pushbutton on Self Test panel.

173. Remove the Self Test Assembly and the Buffer Box Assembly from the CTS.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12218
REV M
INITIAL TDRR 2988

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ________________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________________ SER. NO. ________ ________ CAL DATE

NAME ________________ SER. NO. ________ ________ CAL DATE

CONDUCTED BY ________________ NAME / AFFILIATION APPROVED BY ________________ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
24	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			a
26	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			b
30	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12218
REV M

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30 (cont)			24000		27242			
			30000		33242			
			34000		37242			
50	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			c
52	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			d
56	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
81	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			e
83	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			f
87	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12218
REV. M

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
112	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			g
114	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			h
122	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
137	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			i
139	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			j
143	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
161	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			k

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12218
REV. M

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
163.	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			l
167	Y PIPA about Z (Bias corrected)	arc sec	▨		▨			m
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			n
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			o
	Y PIPA about X (Bias corrected)	arc sec	▨		▨			p
	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			q
	Z PIPA about Y (Bias corrected)	arc sec	▨		▨			r
	X PIPA about Y (Bias corrected)	arc sec	▨		▨			s
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			t
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			u
	Z PIPA about X (Bias corrected)	arc sec	▨		▨			v
	X PIPA about Z (Bias corrected)	arc sec	▨		▨			w
	Z PIPA about X (Bias corrected)	arc	-150		+150			x

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12218
REV. M

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
167	Enter the latest values form JDC 12217 or JDC 12267

X PIPA Bias ____________ cm/sec^2

Y PIPA Bias ____________ cm/sec^2

Z PIPA Bias ____________ cm/sec^2

θ_X = 210 (X PIPA Bias) = ____________ arc sec

θ_Y = 210 (Y PIPA Bias) = ____________ arc sec

θ_Z = 210 (Z PIPA Bias) = ____________ arc sec

Line a - θ_Y = ____________ enter on line m

Line b - θ_Z = ____________ enter on line n

Line c - θ_X = ____________ enter on line o

Line d - θ_Y = ____________ enter on line p

Line e - θ_Y = ____________ enter on line q

Line f - θ_Z = ____________ enter on line r

Line g - θ_X = ____________ enter on line s

Line h - θ_Y = ____________ enter on line t

Line i - θ_X = ____________ enter on line u

Line j - θ_Z = ____________ enter on line v

Line k - θ_X = ____________ enter on line w

Line l - θ_Z = ____________ enter on line x

DATE ______

FORM [illegible]
[illegible] 7-13-65

JOB G & N FINE ALIGN TEST | JDC 12218 REV. N PAGE 1 OF 46
INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars). The SXT measures (cont)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31943	7	-	EA	-
F	4-5-67	33491	1,5	1	EA	-
G	9-6-67	34560	1	-	EA	-
H	9-14-67	34610	1,3,4	-	EA	-
J	10-12-67	34831	1,3,5,6,7	4	EA	-
K	1-4-68	35362	1,7	-	EA	-
L	2-1-68	35549	7	-	EA	-
M	8-7-68	36673	All	All	EA	-
N	8-16-68	36701	38,39	-	EA	-

REFERENCES

IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont): star angles with respect to Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment.

The X and Z Stable Member axis are in turn aligned to local vertical.

IMPORTANT: 1. To prevent erroneous test results, complete each test position within 25 minutes after entering that position.

2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

3. Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB G & N FINE ALIGN TEST | JDC 12218 REV N PAGE 2 OF 46

SUBSYSTEM G & N SYSTEM | ASSY

NOTE: 1. This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

DATE ________

JOB G & N FINE ALIGN TEST | JDC 12218 REV N PAGE 3 OF 46

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to RSLV
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to RSLV
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12218 CTS UPLINK Tape, P/N 2901648

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to RSLV
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to RSLV
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

DATE ________

JOB G & N FINE ALIGN TEST | JDC 12218 REV N PAGE 4 OF 46

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

(B) Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

(C) Set digit switches on Self Test Assembly to 00000.

(D) Self Test panel - Press to light SELF TEST pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

DATE ________

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	(F) Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons. (G) RDC Interface panel - Press to light CH33-10 pushbutton. (H) XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9. (I) Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.
4. Perform following DSKY operations: a. VERB 01 NOUN 10 ENTR b. 00003 ENTR Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.	4. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then perform the following operations: a. Reload UPLINK tape in Tape Reader at beginning of tape.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	b. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that tape advances to beginning of first UPLINK code. c. Press EXECUTE pushbutton on Programmer and Monitor panel. d. Repeat step 4.
INITIALIZATION POSITION 1	INITIALIZATION POSITION 1
5. Perform following DSKY operations: a. VERB 57 ENTR b. 00003 ENTR	5. Press EXECUTE pushbutton on Programmer and Monitor panel.
6. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +XX.XXX (Test site latitude from Table 1) If displays are correct, proceed to step 7, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR To correct only Row 2: VERB 22 ENTR Site latitude from Table 1 ENTR	6. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. VERB 22 shall be flashing 6A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.
TEST POSITION 1 ENTRY	TEST POSITION 1 ENTRY
7. Perform following DSKY operations: a. VERB 33 ENTR b. Observe: VERB 21 NOUN 30 Flashing c. +00001 ENTR	7. Press EXECUTE pushbutton on Programmer and Monitor panel. 7A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
d. Observe: VERB 22 NOUN 30 Flashing e. +00000 ENTR f. Observe: VERB 23 NOUN 30 Flashing g. +00001 ENTR	7B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 7C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
YNB AZIMUTH AND ELEVATION	YNB AZIMUTH AND ELEVATION
8. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +27000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 9, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +27000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001.	8. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +27000 b. Row 2 shall display +00000 c. Row 3 shall display 00001
9. Enter VERB 33 and press ENTR pushbutton on DSKY.	9. Press EXECUTE pushbutton on Programmer and Monitor panel.
ZNB AZIMUTH AND ELEVATION	ZNB AZIMUTH AND ELEVATION
10. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 11, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR	10. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00002

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00002.	
11. Enter VERB 33 and press ENTR pushbutton on DSKY.	11. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 1 DATA INSERTION	TARGET 1 DATA INSERTION
12. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 13, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001	12. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00001
13. Enter VERB 33 and press ENTR pushbutton on DSKY.	13. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 2 DATA INSERTION	TARGET 2 DATA INSERTION
14. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 15,	14. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. Row 2 shall display +00000 c. Row 3 shall display 00002

MANUAL LOAD PROCEDURES

If not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002

15. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

CTS UPLINK TAPE LOAD PROCEDURES

15. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

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MANUAL LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

CTS UPLINK TAPE LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

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MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Enter VERB 34 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

31. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

32. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 33, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI and LO as required.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

31. Press EXECUTE pushbutton on Programmer and Monitor panel.

32. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

32A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 2 ENTRY

33. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 35, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

35. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TEST POSITION 2 ENTRY

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

33A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

35. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 37, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

37. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 39, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001

CTS UPLINK TAPE LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

37. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

MANUAL LOAD PROCEDURES

39. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 41, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

41. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

CTS UPLINK TAPE LOAD PROCEDURES

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

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MANUAL LOAD PROCEDURES

conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

CTS UPLINK TAPE LOAD PROCEDURES

conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

MANUAL LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving bevore proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

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MANUAL LOAD PROCEDURES

57. Perform following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00001 ENTR ENTR
d. 02543 ENTR
e. 00002 ENTR

TEST ENTRY

58. Perform following DSKY operations:
a. VERB 47 ENTR
b. 00003 ENTR

59. When VERB 06 NOUN 61 flash, insure that the DSKY displays on the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 60, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 4 ENTRY

60. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

57. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row shall display +13500
b. VERB 22 shall be flashing

59A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 4 ENTRY

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

60A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

60B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

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MANUAL LOAD PROCEDURES

f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 62, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

62. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 64, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

60C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

62. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Row 3 shall display 00002.	
64. Enter VERB 33 and press ENTR pushbutton on DSKY.	64. Press EXECUTE pushbutton on Programmer and Monitor panel.
YSM DESIRED INSERTION	YSM DESIRED INSERTION
65. When VERB 06 NOUN 61 flash, perform following DSKY operations: a. VERB 21 ENTR b. +13500 ENTR c. VERB 22 ENTR d. +00000 ENTR e. Observe: Row 3 displays 00001.	65. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.
66. Enter VERB 33 and press ENTR pushbutton on DSKY.	66. Press EXECUTE pushbutton on Programmer and Monitor panel.
ZSM DESIRED INSERTION	ZSM DESIRED INSERTION
67. When VERB 06 NOUN 61 flash, perform following DSKY operations: a. VERB 21 ENTR b. +22500 ENTR c. VERB 22 ENTR d. +00000 ENTR e. Observe: Row 3 displays 00002.	67. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.
68. Enter VERB 33 and press ENTR pushbutton on DSKY.	68. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 1 DATA INSERTION	TARGET 1 DATA INSERTION
69. When VERB 06 NOUN 61 flash, insure that the DSKY displays on the following: a. Row 1 displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 70,	69. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00001

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001.	
70. Enter VERB 33 and press ENTR pushbutton on DSKY.	70. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 2 DATA INSERTION	TARGET 2 DATA INSERTION
71. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 72, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00002.	71. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. Row 2 shall display +00000 c. Row 3 shall display 00002.
72. Enter VERB 33 and press ENTR pushbutton on DSKY.	72. Press EXECUTE pushbutton on Programmer and Monitor panel.
COARSE MARK STAR 1	COARSE MARK STAR 1
73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will	73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.	automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.
74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.	74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.
COARSE MARK STAR 2	COARSE MARK STAR 2
75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.	75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.
76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.	76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.
FINE MARK STAR 1	FINE MARK STAR 1
77. The Stable Member will be coarse aligned to the desired test position. In	7. The Stable Member will be coarse aligned to the desired test position. In

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding. NOTE: Minimize the time between MARKS taken in steps 78 and 80.	approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding. NOTE: Minimize the time between MARKS taken in steps 78 and 80.
78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.	78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.
FINE MARK STAR 2	FINE MARK STAR 2
79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.	79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.
80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press	80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press

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MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value

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MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value is not within any set of limits, wait 30

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MANUAL LOAD PROCEDURES

is not within any set of limits, wait 30 minutes and then repeat this step.

88. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00000 ENTR ENTR
d. 02543 ENTR
e. 00001 ENTR

TEST ENTRY

89. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

90. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 91, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 5 ENTRY

91. Perform following DSKY operations:

a. VERB 33 ENTR

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minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

88. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

89. Press EXECUTE pushbutton on Programmer and Monitor panel.

90. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

90A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 5 ENTRY

91. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 93, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

93. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

CTS UPLINK TAPE LOAD PROCEDURES

91A. When VERB 21 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

91B. When VERB 22 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

91C. When VERB 23 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

93. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000

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MANUAL LOAD PROCEDURES

If displays are correct, proceed to step 95, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

95. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001

97. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +00000 ENTR
c. VERB 22 ENTR
d. +89999 ENTR
e. Observe:
Row 3 displays 00002.

99. Enter VERB 33 and press ENTR pushbutton on DSKY.

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b. Row 2 shall display +00000
c. Row 3 shall display 00002

95. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

97. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

99. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 101, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

101. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 103, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

101. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

MANUAL LOAD PROCEDURES

103. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are

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103. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are

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MANUAL LOAD PROCEDURES

satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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MANUAL LOAD PROCEDURES

optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

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optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

MANUAL LOAD PROCEDURES

118. Perform following DSKY operations:

a. VERB 40 NOUN 20 ENTR
Wait 5 seconds
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

119. Set the G & N Mounting Fixture tile axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required). Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indications. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

118. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with step 123. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR

MANUAL LOAD PROCEDURES

123. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

124. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 125, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 3 ENTRY

125. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

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b. 00003 ENTR

123. Press EXECUTE pushbutton on Programmer and Monitor panel.

124. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

124A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 3 ENTRY

125. Press EXECUTE pushbutton on Programmer and Monitor panel.

125A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 127, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

127. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 129, if not perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

127. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

MANUAL LOAD PROCEDURES

129. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set

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129. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set

MANUAL LOAD PROCEDURES

OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

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OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0° respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

MANUAL LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Perform following DSKY operations:

a. VERB 34 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR
j. 01000 ENTR
k. 01770 ENTR
l. 12007 ENTR
m. VERB 30 ENTR
n. VERB 21 NOUN 01 ENTR
o. 00362 ENTR
p. 16002 ENTR
q. VERB 25 NOUN 01 ENTR
r. 03770 ENTR
s. 10067 ENTR
t. 04317 ENTR
u. 01770 ENTR
v. VERB 25 NOUN 26 ENTR

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X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.

MANUAL LOAD PROCEDURES

w. 01000 ENTR
x. 01770 ENTR
y. 00007 ENTR
z. VERB 30 ENTR

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to MAN. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

144. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02444 ENTR
c. 20000 ENTR ENTR
d. 02456 ENTR
e. 57777 ENTR ENTR
f. 02457 ENTR
g. 77777 ENTR ENTR
h. 02462 ENTR

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INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to MAN. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

144. Press EXECUTE pushbutton on Programmer and Monitor panel.

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i. 20000 ENTR ENTR
j. 02543 ENTR
k. 00002 ENTR

TEST ENTRY

145. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

146. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 147, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 6 ENTRY

147. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00004 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

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TEST ENTRY

145. Press EXECUTE pushbutton on Programmer and Monitor panel.

146. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

146A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 6 ENTRY

147. Press EXECUTE pushbutton on Programmer and Monitor panel.

147A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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148. When VERB 21 NOUN 22 flash, perform following DSKY operations:

a. +27000 ENTR

b. Observe:
VERB 22 NOUN 22 Flashing

c. +31500 ENTR

d. Observe:
VERB 23 NOUN 22 Flashing

e. +27000 ENTR

TARGET 1 DATA INSERTION

149. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00001

If displays are correct, proceed to step 150, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

150. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

151. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +00000

c. Row 3 displays 00002

If displays are correct, proceed to step 152,

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148. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

148A. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

148B. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

149. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000

b. Row 2 shall display +00000

c. Row 3 shall display 00001.

150. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

151. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500

b. Row 2 shall display +00000

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if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

152. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's

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c. Row 3 shall display 00002.

152. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's

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indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 158 and 160.

158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

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indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 158 and 160.

158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

FINE MARK STAR 2

159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

162. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

164. Perform following DSKY operations:

a. VERB 34 ENTR

b. Observe:
PROG display indicates 00.

CTS UPLINK TAPE LOAD PROCEDURES

FINE MARK STAR 2

159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

162. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

164. Press EXECUTE pushbutton on Programmer and Monitor panel. The PROG display on the DSKY shall indicate 00.

DATE ________

MANUAL LOAD PROCEDURES

c. VERB 40 NOUN 20 ENTR
Wait 5 seconds
d. VERB 41 NOUN 20 ENTR
e. Observe:
VERB 21 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 22 NOUN 22 Flashing
h. +00000 ENTR
i. Observe:
q VERB 23 NOUN 22 Flashing
j. +00000 ENTR

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

CTS UPLINK TAPE LOAD PROCEDURES

164A. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

164B. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164C. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164D. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

DATE ________

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

168. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Press to extinguish AGC INPUT-CTR and TAPE FREE RUN pushbuttons on Programmer and Monitor panel.

171. Set Power switch on Tape Reader to OFF and remove tape.

172. Press to extinguish SELF TEST pushbutton on Self Test panel.

173. Remove the Self Test Assembly and the Buffer Box Assembly from the CTS.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12218
REV N
INITIAL TDRR 29881

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ______ CAL DATE ______
NAME ________ SER. NO. ______ CAL DATE ______

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
24	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			a
26	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			b
30	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12218
REV N

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30 (cont)			24000		27242			
			30000		33242			
			34000		37242			
50	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			c
52	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			d
56	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
81	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			e
83	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			f
87	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12218
REV. N

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
112	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			g
114	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			h
122	Row 1 indication	time	00000		03242			
		bits	04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
137	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			i
139	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			j
143	Row 1 indication	time	00000		03242			
		bits	04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
161	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			k

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12218
REV. N

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
163	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			l
167	Y PIPA about Z (Bias corrected)	arc sec	▨		▨			m
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			n
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			o
	Y PIPA about X (Bias corrected)	arc sec	▨		▨			p
	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			q
	Z PIPA about Y (Bias corrected)	arc sec	▨		▨			r
	X PIPA about Y (Bias corrected)	arc sec	▨		▨			s
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			t
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			u
	Z PIPA about X (Bias corrected)	arc sec	▨		▨			v
	X PIPA about Z (Bias corrected)	arc sec	▨		▨			w
	Z PIPA about X (Bias corrected)	arc	-150		+150			x

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12218
REV. N

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
167	Enter the latest values form JDC 12217 or JDC 12267

X PIPA Bias ____________ cm/sec^2
Y PIPA Bias ____________ cm/sec^2
Z PIPA Bias ____________ cm/sec^2
θ_X = 210 (X PIPA Bias) = ____________ arc sec
θ_Y = 210 (Y PIPA Bias) = ____________ arc sec
θ_Z = 210 (Z PIPA Bias) = ____________ arc sec
Line a - θ_Y = ____________ enter on line m
Line b - θ_Z = ____________ enter on line n
Line c - θ_X = ____________ enter on line o
Line d - θ_Y = ____________ enter on line p
Line e - θ_Y = ____________ enter on line q
Line f - θ_Z = ____________ enter on line r
Line g - θ_X = ____________ enter on line s
Line h - θ_Y = ____________ enter on line t
Line i - θ_X = ____________ enter on line u
Line j - θ_Z = ____________ enter on line v
Line k - θ_X = ____________ enter on line w
Line l - θ_Z = ____________ enter on line x

DATE ________

FORM 00748
Chg. 7-23-65

JOB G & N FINE ALIGN TEST

JDC 12218 REV. P PAGE 1 OF 46

INITIAL TDRR 29882 D.S. PGS. 5

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars). The SXT measures (cont)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30303	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31943	7	-	EA	-
F	4-5-67	33491	1,5	1	EA	-
G	9-6-67	34560	1	-	EA	-
H	9-14-67	34610	1,3,4	-	EA	-
J	10-12-67	34831	1,3,5,6,7	4	EA	-
K	1-4-68	35362	1,7	-	EA	-
L	2-1-68	35549	7	-	EA	-
M	8-7-68	36673	All	All	EA	-
N	8-16-68	36701	38,39	-	EA	-
P	8-26-68	36715	24,46	-	EA	-

REFERENCES

IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont): star angles with respect to Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment.

The X and Z Stable Member axis are in turn aligned to local vertical.

IMPORTANT: 1. To prevent erroneous test results, complete each test position within 25 minutes after entering that position.

2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

3. Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector.

VERIFICATION WITH SDL REQUIRED BEFORE USE

DATE ________

JOB G & N FINE ALIGN TEST

JDC 12218 REV P PAGE 2 OF 46

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: 1. This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

DATE ________

JOB G & N FINE ALIGN TEST

JDC 12218 REV P PAGE 3 OF 46

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   - (1) OPTICS ZERO to OFF then to ZERO
   - (2) OPTICS TEL TRUN to SLAVE TO SXT
   - (3) OPTICS COUPLING to RSLV
   - (4) OPTICS MODE to MAN
   - (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   - (1) OPTICS MODE to MAN then to ZERO
   - (2) OPTICS CONTROLLER SPEED to LO
   - (3) OPTICS CONTROLLER COUPLING to RSLV
   - (4) OPTICS TRACKER to OFF
   - (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12218 CTS UPLINK Tape, P/N 2901648

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   - (1) OPTICS ZERO to OFF then to ZERO
   - (2) OPTICS TEL TRUN to SLAVE TO SXT
   - (3) OPTICS COUPLING to RSLV
   - (4) OPTICS MODE to MAN
   - (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   - (1) OPTICS MODE to MAN then to ZERO
   - (2) OPTICS CONTROLLER SPEED to LO
   - (3) OPTICS CONTROLLER COUPLING to RSLV
   - (4) OPTICS TRACKER to OFF
   - (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

DATE ________

JOB G & N FINE ALIGN TEST

JDC 12218 REV P PAGE 4 OF 46

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

(B) Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

(C) Set digit switches on Self Test Assembly to 00000.

(D) Self Test panel - Press to light SELF TEST pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

DATE ________

MANUAL LOAD PROCEDURES

4. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

(F) Programmer and Monitor panel -
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.
(G) RDC Interface panel -
Press to light CH33-10 pushbutton.
(H) XY Interface panel -
Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons.
Set AGC INPUT COUNTERS switch to 9.
(I) Programmer and Monitor panel -
Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code.
Press EXECUTE pushbutton.

4. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then perform the following operations:
a. Reload UPLINK tape in Tape Reader at beginning of tape.

DATE ________

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 1

5. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR
6. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)
If displays are correct, proceed to step 7, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 1 ENTRY

7. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00001 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

b. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that tape advances to beginning of first UPLINK code.
c. Press EXECUTE pushbutton on Programmer and Monitor panel.
d. Repeat step 4.

INITIALIZATION POSITION 1

5. Press EXECUTE pushbutton on Programmer and Monitor panel.
6. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing
6A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 1 ENTRY

7. Press EXECUTE pushbutton on Programmer and Monitor panel.
7A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES

d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

8. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001
If displays are correct, proceed to step 9, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.
9. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

10. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002
If displays are correct, proceed to step 11, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

7B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
7C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

8. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001
9. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

10. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002

DATE ________

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.
11. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

12. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001
If displays are correct, proceed to step 13, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001
13. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

14. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002
If displays are correct, proceed to step 15,

CTS UPLINK TAPE LOAD PROCEDURES

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

12. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001
13. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

14. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002

DATE ________

MANUAL LOAD PROCEDURES

If not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002

15. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

CTS UPLINK TAPE LOAD PROCEDURES

15. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

---

MANUAL LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

CTS UPLINK TAPE LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

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MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Enter VERB 34 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

31. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

32. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 33, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI and LO as required.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

31. Press EXECUTE pushbutton on Programmer and Monitor panel.

32. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

32A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 2 ENTRY

33. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 35, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

35. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TEST POSITION 2 ENTRY

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

33A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

35. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 37, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

37. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 39, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

CTS UPLINK TAPE LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

37. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

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MANUAL LOAD PROCEDURES

39. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 41, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

41. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

CTS UPLINK TAPE LOAD PROCEDURES

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

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MANUAL LOAD PROCEDURES

conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

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conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

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MANUAL LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving bevore proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

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MANUAL LOAD PROCEDURES

57. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00001 ENTR ENTR
d. 02543 ENTR
e. 00002 ENTR

TEST ENTRY

58. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

59. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 60, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 4 ENTRY

60. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

57. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing.

59A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 4 ENTRY

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

60A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

60B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 62, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

62. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 64, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR

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60C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

62. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

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MANUAL LOAD PROCEDURES

Row 3 shall display 00002.

64. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

65. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001.

66. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

67. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +22500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00002.

68. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

69. When VERB 06 NOUN 61 flash, insure that the DSKY displays on the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 70,

CTS UPLINK TAPE LOAD PROCEDURES

64. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

65. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

66. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

67. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

68. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

69. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

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MANUAL LOAD PROCEDURES

if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

70. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

71. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 72, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

72. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

CTS UPLINK TAPE LOAD PROCEDURES

70. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

71. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

72. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

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MANUAL LOAD PROCEDURES

automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

77. The Stable Member will be coarse aligned to the desired test position. In

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automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

77. The Stable Member will be coarse aligned to the desired test position. In

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MANUAL LOAD PROCEDURES

approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 78 and 80.

78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 81, if not, press

CTS UPLINK TAPE LOAD PROCEDURES

approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 78 and 80.

78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 81, if not, press

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MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value

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MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value is not within any set of limits, wait 30

MANUAL LOAD PROCEDURES

is not within any set of limits, wait 30 minutes and then repeat this step.

88. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00000 ENTR ENTR
d. 02543 ENTR
e. 00001 ENTR

TEST ENTRY

89. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

90. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX. XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 91, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 5 ENTRY

91. Perform following DSKY operations:

a. VERB 33 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

88. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

89. Press EXECUTE pushbutton on Programmer and Monitor panel.

90. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

90A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 5 ENTRY

91. Press EXECUTE pushbutton on Programmer and Monitor panel.

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b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 93, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

93. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

CTS UPLINK TAPE LOAD PROCEDURES

91A. When VERB 21 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

91B. When VERB 22 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

91C. When VERB 23 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

93. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000

MANUAL LOAD PROCEDURES

If displays are correct, proceed to step 95, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

95. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001.

97. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +00000 ENTR
c. VERB 22 ENTR
d. +89999 ENTR
e. Observe:
Row 3 displays 00002.

99. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

b. Row 2 shall display +00000
c. Row 3 shall display 00002.

95. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

97. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

99. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 101, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

101. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 103, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

101. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

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MANUAL LOAD PROCEDURES

103. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are

CTS UPLINK TAPE LOAD PROCEDURES

103. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are

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MANUAL LOAD PROCEDURES

satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

CTS UPLINK TAPE LOAD PROCEDURES

satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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MANUAL LOAD PROCEDURES

optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

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optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

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MANUAL LOAD PROCEDURES

118. Perform following DSKY operations:

a. VERB 40 NOUN 20 ENTR
Wait 5 seconds
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

118. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR

MANUAL LOAD PROCEDURES

123. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

124. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 125, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 3 ENTRY

125. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

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b. 00003 ENTR

123. Press EXECUTE pushbutton on Programmer and Monitor panel.

124. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

124A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 3 ENTRY

125. Press EXECUTE pushbutton on Programmer and Monitor panel.

125A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 127, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

127. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 129, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

127. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

MANUAL LOAD PROCEDURES

129. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set

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129. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set

MANUAL LOAD PROCEDURES

OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

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OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0° respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Perform following DSKY operations:

a. VERB 34 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR
j. 01000 ENTR
k. 01770 ENTR
l. 12007 ENTR
m. VERB 30 ENTR
n. VERB 21 NOUN 01 ENTR
o. 00362 ENTR
p. 16002 ENTR
q. VERB 25 NOUN 01 ENTR
r. 03770 ENTR
s. 10067 ENTR
t. 04317 ENTR
u. 01770 ENTR
v. VERB 25 NOUN 26 ENTR

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X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.

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w. 01000 ENTR
x. 01770 ENTR
y. 00007 ENTR
z. VERB 30 ENTR

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to MAN. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

144. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02444 ENTR
c. 20000 ENTR ENTR
d. 02456 ENTR
e. 57777 ENTR ENTR
f. 02457 ENTR
g. 77777 ENTR ENTR
h. 02462 ENTR

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INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to MAN. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

144. Press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES

i. 20000 ENTR ENTR
j. 02543 ENTR
k. 00002 ENTR

TEST ENTRY

145. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

146. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 147, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 6 ENTRY

147. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00004 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

TEST ENTRY

145. Press EXECUTE pushbutton on Programmer and Monitor panel.

146. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

146A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 6 ENTRY

147. Press EXECUTE pushbutton on Programmer and Monitor panel.

147A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES

148. When VERB 21 NOUN 22 flash, perform following DSKY operations:

a. +27000 ENTR
b. Observe:
VERB 22 NOUN 22 Flashing
c. +31500 ENTR
d. Observe:
VERB 23 NOUN 22 Flashing
e. +27000 ENTR

TARGET 1 DATA INSERTION

149. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 150, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

150. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

151. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 152,

CTS UPLINK TAPE LOAD PROCEDURES

148. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

148A. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

148B. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

149. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

150. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

151. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000

MANUAL LOAD PROCEDURES

if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

152. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's

CTS UPLINK TAPE LOAD PROCEDURES

c. Row 3 shall display 00002.

152. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's

---

MANUAL LOAD PROCEDURES

indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 158 and 160.

158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 158 and 160.

158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

MANUAL LOAD PROCEDURES

FINE MARK STAR 2

159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

162. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

164. Perform following DSKY operations:

a. VERB 34 ENTR
b. Observe:
PROG display indicates 00.

CTS UPLINK TAPE LOAD PROCEDURES

FINE MARK STAR 2

159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

162. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

164. Press EXECUTE pushbutton on Programmer and Monitor panel. The PROG display on the DSKY shall indicate 00.

MANUAL LOAD PROCEDURES

c. VERB 40 NOUN 20 ENTR
Wait 5 seconds
d. VERB 41 NOUN 20 ENTR
e. Observe:
VERB 21 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 22 NOUN 22 Flashing
h. +00000 ENTR
i. Observe:
VERB 23 NOUN 22 Flashing
j. +00000 ENTR

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

CTS UPLINK TAPE LOAD PROCEDURES

164A. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

164B. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164C. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164D. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

DATE ________

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

168. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press MONITOR pushbutton. MONITOR pushbutton shall light and AGC INPUT-CTR pushbutton shall go out.

171. Set Power switch on Tape Reader to OFF and remove tape.

172. Press to extinguish SELF TEST pushbutton on Self Test panel.

173. Disconnect Self Test Assembly from Buffer Box Assembly. Connect cable W226 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12218
REV P
INITIAL TDRR 29832

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ________	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ____ CAL DATE
NAME ________ SER. NO. ____ CAL DATE

CONDUCTED BY ________ NAME / AFFILIATION APPROVED BY ________ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
24	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____ . ____	▨			a
26	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____ . ____	▨			b
30	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12218
REV P

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30 (cont)			24000		27242			
			30000		33242			
			34000		37242			
50	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____ . ____	▨			c
52	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____ . ____	▨			d
56	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
81	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____ . ____	▨			e
83	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____ . ____	▨			f
87	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12218
REV. P

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
112	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			g
114	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			h
122	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
137	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			i
139	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			j
143	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
161	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			k

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12218
REV. P

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
163	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			l
167	Y PIPA about Z (Bias corrected)	arc sec	▨		▨			m
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			n
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			o
	Y PIPA about X (Bias corrected)	arc sec	▨		▨			p
	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			q
	Z PIPA about Y (Bias corrected)	arc sec	▨		▨			r
	X PIPA about Y (Bias corrected)	arc sec	▨		▨			s
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			t
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			u
	Z PIPA about X (Bias corrected)	arc sec	▨		▨			v
	X PIPA about Z (Bias corrected)	arc sec	▨		▨			w
	Z PIPA about X (Bias corrected)	arc	-150		+150			x

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12218
REV. P

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
167	Enter the latest values form JDC 12217 or JDC 12267

X PIPA Bias ____________________ cm/sec^2
Y PIPA Bias ____________________ cm/sec^2
Z PIPA Bias ____________________ cm/sec^2
θ_X = 210 (X PIPA Bias) = ____________________ arc sec
θ_Y = 210 (Y PIPA Bias) = ____________________ arc sec
θ_Z = 210 (Z PIPA Bias) = ____________________ arc sec
Line a - θ_Y = ____________________ enter on line m
Line b - θ_Z = ____________________ enter on line n
Line c - θ_X = ____________________ enter on line o
Line d - θ_Y = ____________________ enter on line p
Line e - θ_Y = ____________________ enter on line q
Line f - θ_Z = ____________________ enter on line r
Line g - θ_X = ____________________ enter on line s
Line h - θ_Y = ____________________ enter on line t
Line i - θ_X = ____________________ enter on line u
Line j - θ_Z = ____________________ enter on line v
Line k - θ_X = ____________________ enter on line w
Line l - θ_Z = ____________________ enter on line x

DATE ________

FORM 30718
Chg. 7-23-65

JOB G & N FINE ALIGN TEST | JDC 12218 REV. R PAGE 1 OF 46.

INITIAL TDRR 29882 D.S. PGS 5

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars). The SXT measures (cont)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30303	6, 7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1, 7	1	EA	-
E	11-15-66	31943	7	-	EA	-
F	4-5-67	33491	1, 5	1	EA	-
G	9-6-67	34560	1	-	EA	-
H	9-14-67	34610	1, 3, 4	-	EA	-
J	10-12-67	34831	1, 3, 5, 6, 7	4	EA	-
K	1-4-68	35362	1, 7	-	EA	-
L	2-1-68	35549	7	-	EA	-
M	8-7-68	36673	All	All	EA	-
N	8-16-68	36701	38, 39	-	EA	-
P	8-26-68	36715	24, 46	-	EA	-
R	10-21-68	36928	3, 38-40	-	EA	-

REFERENCES

IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont): star angles with respect to Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment.

The X and Z Stable Member axis are in turn aligned to local vertical.

IMPORTANT: 1. To prevent erroneous test results, complete each test position within 25 minutes after entering that position.

2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

3. Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ____________

JOB G & N FINE ALIGN TEST | JDC 12218 REV R PAGE 2 OF 46

SUBSYSTEM G & N SYSTEM | ASSY

NOTE: 1. This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

DATE ____________

JOB G & N FINE ALIGN TEST | JDC 12218 REV R PAGE 3 OF 46

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
  (1) OPTICS ZERO to OFF then to ZERO
  (2) OPTICS TEL TRUN to SLAVE TO SXT
  (3) OPTICS COUPLING to RSLV
  (4) OPTICS MODE to MAN
  (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
  (1) OPTICS MODE to MAN then to ZERO
  (2) OPTICS CONTROLLER SPEED to LO
  (3) OPTICS CONTROLLER COUPLING to RSLV
  (4) OPTICS TRACKER to OFF
  (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12218 CTS UPLINK Tape, P/N 2901648-002

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
  (1) OPTICS ZERO to OFF then to ZERO
  (2) OPTICS TEL TRUN to SLAVE TO SXT
  (3) OPTICS COUPLING to RSLV
  (4) OPTICS MODE to MAN
  (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
  (1) OPTICS MODE to MAN then to ZERO
  (2) OPTICS CONTROLLER SPEED to LO
  (3) OPTICS CONTROLLER COUPLING to RSLV
  (4) OPTICS TRACKER to OFF
  (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

DATE ____________

JOB G & N FINE ALIGN TEST | JDC 12218 REV R PAGE 4 OF 46

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

(B) Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

(C) Set digit switches on Self Test Assembly to 00000.

(D) Self Test panel - Press to light SELF TEST pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

DATE ____________

MANUAL LOAD PROCEDURES

4. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

(F) Programmer and Monitor panel -
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.
(G) RDC Interface panel -
Press to light CH33-10 pushbutton.
(H) XY Interface panel -
Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons.
Set AGC INPUT COUNTERS switch to 9.
(I) Programmer and Monitor panel -
Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code.
Press EXECUTE pushbutton.

4. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then perform the following operations:
a. Reload UPLINK tape in Tape Reader at beginning of tape.

DATE ______

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 1

5. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

6. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 7, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 1 ENTRY

7. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00001 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

b. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that tape advances to beginning of first UPLINK code.
c. Press EXECUTE pushbutton on Programmer and Monitor panel.
d. Repeat step 4.

INITIALIZATION POSITION 1

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

6. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

6A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 1 ENTRY

7. Press EXECUTE pushbutton on Programmer and Monitor panel.

7A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

8. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 9, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

9. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

10. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 11, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

7B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

7C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

8. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

9. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

10. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002

DATE ______

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

11. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

12. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 13, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001

13. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

14. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 15,

CTS UPLINK TAPE LOAD PROCEDURES

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

12. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

14. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002

DATE ______

MANUAL LOAD PROCEDURES

If not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002

15. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

CTS UPLINK TAPE LOAD PROCEDURES

15. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

DATE ________

MANUAL LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

CTS UPLINK TAPE LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

DATE ________

MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Enter VERB 34 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

31. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

32. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 33, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI and LO as required.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

31. Press EXECUTE pushbutton on Programmer and Monitor panel.

32. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

32A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

DATE ________

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 2 ENTRY

33. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 35, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

35. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TEST POSITION 2 ENTRY

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

33A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

35. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 37, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

37. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 39, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

CTS UPLINK TAPE LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

37. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

MANUAL LOAD PROCEDURES

39. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 41, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

41. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

CTS UPLINK TAPE LOAD PROCEDURES

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

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MANUAL LOAD PROCEDURES

conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

CTS UPLINK TAPE LOAD PROCEDURES

conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NOTE: Minimize the time between MARKS taken in steps 47 and 49.	NOTE: Minimize the time between MARKS taken in steps 47 and 49.
47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.	47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.
FINE MARK STAR 2	FINE MARK STAR 2
48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving bevore proceeding.	48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.
49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.	49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
X PIPA ABOUT Y MISALIGNMENT	X PIPA ABOUT Y MISALIGNMENT
50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.	50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.
51. Enter VERB 33 and press ENTR pushbutton on DSKY.	51. Press EXECUTE pushbutton on Programmer and Monitor panel.
Y PIPA ABOUT X MISALIGNMENT	Y PIPA ABOUT X MISALIGNMENT
52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.	52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.
53. Enter VERB 34 and press ENTR pushbutton on DSKY.	53. Press EXECUTE pushbutton on Programmer and Monitor panel.
INITIALIZATION POSITION 4	INITIALIZATION POSITION 4
54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.	54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.
55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.	55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.
56. Perform following DSKY operations: a. VERB 01 NOUN 10 ENTR b. 00003 ENTR Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.	56. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations: a. VERB 01 NOUN 10 ENTR b. 00003 ENTR

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
57. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 02542 ENTR c. 00001 ENTR ENTR d. 02543 ENTR e. 00002 ENTR	57. Press EXECUTE pushbutton on Programmer and Monitor panel.
TEST ENTRY	TEST ENTRY
58. Perform following DSKY operations: a. VERB 57 ENTR b. 00003 ENTR	58. Press EXECUTE pushbutton on Programmer and Monitor panel.
59. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +XX.XXX (Test site latitude from Table 1) If displays are correct, proceed to step 60, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR To correct only Row 2: VERB 22 ENTR Site latitude from Table 1 ENTR	59. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. VERB 22 shall be flashing. 59A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.
TEST POSITION 4 ENTRY	TEST POSITION 4 ENTRY
60. Perform following DSKY operations: a. VERB 33 ENTR b. Observe: VERB 21 NOUN 30 Flashing c. +00005 ENTR d. Observe: VERB 22 NOUN 30 Flashing e. +00000 ENTR	60. Press EXECUTE pushbutton on Programmer and Monitor panel. 60A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 60B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
f. Observe: VERB 23 NOUN 30 Flashing g. +00001 ENTR	60C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
YNB AZIMUTH AND ELEVATION	YNB AZIMUTH AND ELEVATION
61. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +27000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 62, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +27000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001.	61. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +27000 b. Row 2 shall display +00000 c. Row 3 shall display 00001.
62. Enter VERB 33 and press ENTR pushbutton on DSKY.	62. Press EXECUTE pushbutton on Programmer and Monitor panel.
ZNB AZIMUTH AND ELEVATION	ZNB AZIMUTH AND ELEVATION
63. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 64, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR	63. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00002.

MANUAL LOAD PROCEDURES

Row 3 shall display 00002.

64. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

65. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001.

66. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

67. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +22500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00002.

68. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

69. When VERB 06 NOUN 61 flash, insure that the DSKY displays on the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 70,

CTS UPLINK TAPE LOAD PROCEDURES

64. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

65. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

66. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

67. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

68. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

69. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

MANUAL LOAD PROCEDURES

if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

70. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

71. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 72, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

72. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

CTS UPLINK TAPE LOAD PROCEDURES

70. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

71. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

72. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

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MANUAL LOAD PROCEDURES

automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

77. The Stable Member will be coarse aligned to the desired test position. In

CTS UPLINK TAPE LOAD PROCEDURES

automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

77. The Stable Member will be coarse aligned to the desired test position. In

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MANUAL LOAD PROCEDURES

approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 78 and 80.

78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 81, if not, press

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approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 78 and 80.

78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 81, if not, press

MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value

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MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value is not within any set of limits, wait 30

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MANUAL LOAD PROCEDURES

is not within any set of limits, wait 30 minutes and then repeat this step.

88. Perform following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00000 ENTR ENTR
d. 02543 ENTR
e. 00001 ENTR

TEST ENTRY

89. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

90. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX. XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 91, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 5 ENTRY

91. Perform following DSKY operations:
a. VERB 33 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

minutes and then perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

88. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

89. Press EXECUTE pushbutton on Programmer and Monitor panel.

90. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

90A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 5 ENTRY

91. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 93, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

93. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

CTS UPLINK TAPE LOAD PROCEDURES

91A. When VERB 21 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

91B. When VERB 22 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

91C. When VERB 23 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

93. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000

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MANUAL LOAD PROCEDURES

If displays are correct, proceed to step 95, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

95. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, perform following DSKY operations:
a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001.

97. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, perform following DSKY operations:
a. VERB 21 ENTR
b. +00000 ENTR
c. VERB 22 ENTR
d. +89999 ENTR
e. Observe:
Row 3 displays 00002.

99. Enter VERB 33 and press ENTR pushbutton on DSKY.

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b. Row 2 shall display +00000
c. Row 3 shall display 00002.

95. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

97. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

99. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 101, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

101. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct. proceed to step 103, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

101. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

MANUAL LOAD PROCEDURES

103. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are

CTS UPLINK TAPE LOAD PROCEDURES

103. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are

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MANUAL LOAD PROCEDURES

satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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MANUAL LOAD PROCEDURES

optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

CTS UPLINK TAPE LOAD PROCEDURES

optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

MANUAL LOAD PROCEDURES

118. Perform following DSKY operations:
a. VERB 40 NOUN 20 ENTR
Wait 5 seconds
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

118. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR

MANUAL LOAD PROCEDURES

123. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

124. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX. XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 125, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 3 ENTRY

125. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

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b. 00003 ENTR

123. Press EXECUTE pushbutton on Programmer and Monitor panel.

124. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

124A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 3 ENTRY

125. Press EXECUTE pushbutton on Programmer and Monitor panel.

125A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 127, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

127. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 129, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

127. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

MANUAL LOAD PROCEDURES

129. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set

CTS UPLINK TAPE LOAD PROCEDURES

129. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set

MANUAL LOAD PROCEDURES

OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0° respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

DATE ________

MANUAL LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Perform following DSKY operations:

a.	VERB 34		ENTR	
b.	VERB 21	NOUN 01	ENTR	
c.	03700		ENTR	
d.	33663		ENTR	
e.	NOUN 15		ENTR	
f.	55426		ENTR	ENTR
g.	04064		ENTR	ENTR
h.	15374		ENTR	
i.	VERB 25	NOUN 26	ENTR	
j.	20000		ENTR	
k.	01700		ENTR	
l.	12007		ENTR	
m.	VERB 30		ENTR	
n.	VERB 21	NOUN 01	ENTR	
o.	00362		ENTR	
p.	16002		ENTR	
q.	VERB 25	NOUN 01	ENTR	
r.	03770		ENTR	
s.	10067		ENTR	
t.	04317		ENTR	
u.	01770		ENTR	
v.	VERB 25	NOUN 26	ENTR	

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.

DATE ________

MANUAL LOAD PROCEDURES

w.	01000	ENTR
x.	01770	ENTR
y.	00007	ENTR
z.	VERB 30	ENTR

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Perform following DSKY operations:

a.	VERB 01	NOUN 10	ENTR
b.	00003		ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

144. Perform following DSKY operations:

a.	VERB 21	NOUN 01	ENTR	
b.	02444		ENTR	
c.	20000		ENTR	ENTR
d.	02456		ENTR	
e.	57777		ENTR	ENTR
f.	02457		ENTR	
g.	77777		ENTR	ENTR
h.	02462		ENTR	

CTS UPLINK TAPE LOAD PROCEDURES

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a.	VERB 01	NOUN 10	ENTR
b.	00003		ENTR

144. Press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES

i.	20000	ENTR	ENTR
j.	02543	ENTR	
k.	00002	ENTR	

TEST ENTRY

145. Perform following DSKY operations:

a.	VERB 57	ENTR
b.	00003	ENTR

146. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 147, if not, perform following DSKY operations:

To correct only Row 1:

VERB 21	ENTR
+13500	ENTR

To correct only Row 2:

VERB 22	ENTR
Site latitude from Table 1	ENTR

TEST POSITION 6 ENTRY

147. Perform following DSKY operations:

a.	VERB 33		ENTR
b.	Observe:		
	VERB 21	NOUN 30	Flashing
c.	+00004		ENTR
d.	Observe:		
	VERB 22	NOUN 30	Flashing
e.	+00000		ENTR
f.	Observe:		
	VERB 23	NOUN 30	Flashing
g.	+00000		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

TEST ENTRY

145. When tape stops, press EXECUTE pushbutton on Programmer and Monitor panel.

146. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

146A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 6 ENTRY

147. Press EXECUTE pushbutton on Programmer and Monitor panel.

147A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES

148. When VERB 21 NOUN 22 flash, perform following DSKY operations:

a. +27000 ENTR

b. Observe:

VERB 22 NOUN 22 Flashing

c. +31500 ENTR

d. Observe:

VERB 23 NOUN 22 Flashing

e. +27000 ENTR

TARGET 1 DATA INSERTION

149. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 150, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

150. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

151. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 152,

CTS UPLINK TAPE LOAD PROCEDURES

148. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

148A. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

148B. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

149. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

150. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

151. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000

MANUAL LOAD PROCEDURES

if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

152. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's

CTS UPLINK TAPE LOAD PROCEDURES

c. Row 3 shall display 00002.

152. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's

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MANUAL LOAD PROCEDURES

indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 158 and 160.

158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively. Set OPTICS COUPLING switch to RSLV.

NOTE: Minimize the time between MARKS taken in steps 158 and 160.

158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

MANUAL LOAD PROCEDURES

FINE MARK STAR 2

159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

162. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

164. Perform following DSKY operations:

a. VERB 34 ENTR

b. Observe:

PROG display indicates 00.

CTS UPLINK TAPE LOAD PROCEDURES

FINE MARK STAR 2

159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

162. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

164. Press EXECUTE pushbutton on Programmer and Monitor panel. The PROG display on the DSKY shall indicate 00.

MANUAL LOAD PROCEDURES

c. VERB 40 NOUN 20 ENTR
Wait 5 seconds
d. VERB 41 NOUN 20 ENTR
e. Observe:
VERB 21 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 22 NOUN 22 Flashing
h. +00000 ENTR
i. Observe:
q VERB 23 NOUN 22 Flashing
j. +00000 ENTR

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

CTS UPLINK TAPE LOAD PROCEDURES

164A. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

164B. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164C. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164D. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

DATE ________

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

168. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press MONITOR pushbutton. MONITOR pushbutton shall light and AGC INPUT-CTR pushbutton shall go out.

171. Set Power switch on Tape Reader to OFF and remove tape.

172. Press to extinguish SELF TEST pushbutton on Self Test panel.

173. Disconnect Self Test Assembly from Buffer Box Assembly. Connect cable W226 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12218
REV R
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ________________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________________ SER. NO. ______ ______ CAL DATE
NAME ________________ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ________ NAME / AFFILIATION APPROVED BY ________ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
24	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			a
26	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			b
30	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12218
REV R

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30 (cont)			24000		27242			
			30000		33242			
			34000		37242			
50	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			c
52	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			d
56	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
81	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			e
83	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			f
87	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12218
REV. R

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
112	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			g
114	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			h
122	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
137	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			i
139	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			j
143	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
161	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			k

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12218
REV. R

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
163	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			l
167	Y PIPA about Z (Bias corrected)	arc sec	▨		▨			m
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			n
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			o
	Y PIPA about X (Bias corrected)	arc sec	▨		▨			p
	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			q
	Z PIPA about Y (Bias corrected)	arc sec	▨		▨			r
	X PIPA about Y (Bias corrected)	arc sec	▨		▨			s
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			t
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			u
	Z PIPA about X (Bias corrected)	arc sec	▨		▨			v
	X PIPA about Z (Bias corrected)	arc sec	▨		▨			w
	Z PIPA about X (Bias corrected)	arc	-150		+150			x

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12218
REV. R

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
167	Enter the latest values form JDC 12217 or JDC 12267
	X PIPA Bias ____________ cm/sec^2
	Y PIPA Bias ____________ cm/sec^2
	Z PIPA Bias ____________ cm/sec^2
	θ_X = 210 (X PIPA Bias) = ____________ arc sec
	θ_Y = 210 (Y PIPA Bias) = ____________ arc sec
	θ_Z = 210 (Z PIPA Bias) = ____________ arc sec
	Line a - θ_Y = ____________ enter on line m
	Line b - θ_Z = ____________ enter on line n
	Line c - θ_X = ____________ enter on line o
	Line d - θ_Y = ____________ enter on line p
	Line e - θ_Y = ____________ enter on line q
	Line f - θ_Z = ____________ enter on line r
	Line g - θ_X = ____________ enter on line s
	Line h - θ_Y = ____________ enter on line t
	Line i - θ_X = ____________ enter on line u
	Line j - θ_Z = ____________ enter on line v
	Line k - θ_X = ____________ enter on line w
	Line l - θ_Z = ____________ enter on line x

DATE ________

JOB G & N FINE ALIGN TEST

JDC 12218 REV. S PAGE 1 OF 46

INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars). The SXT measures (cont)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31943	7	-	EA	-
F	4-5-67	33491	1,5	1	EA	-
G	9-6-67	34560	1	-	EA	-
H	9-14-67	34610	1,3,4	-	EA	-
J	10-12-67	34831	1,3,5,6,7	4	EA	-
K	1-4-68	35362	1,7	-	EA BD	-
L	2-1-68	35549	7	-	EA BD	-
M	8-7-68	36673	All	All	EA	-
N	8-16-68	36701	38,39	-	EA	-
P	8-26-68	36715	24,46	-	EA	-
R	10-21-68	36928	3,38-40	-	EA	-
S	12-3-68	37088	12,18,26, 34,36,37, 39,42,43, 46	-	EA	-

REFERENCES

IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont): star angles with respect to Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment.

The X and Z Stable Member axis are in turn aligned to local vertical.

IMPORTANT: 1. To prevent erroneous test results, complete each test position within 25 minutes after entering that position.

2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

3. Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ____

JOB G & N FINE ALIGN TEST

JDC 12218 REV S PAGE 2 OF 46

SUBSYSTEM G & N SYSTEM

ASSY

NOTE: 1. This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

DATE ____

JOB G & N FINE ALIGN TEST

JDC 12218 REV S PAGE 3 OF 46

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to RSLV
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to RSLV
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12218 CTS UPLINK Tape, P/N 2901648-002

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to RSLV
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to RSLV
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

DATE ____

JOB G & N FINE ALIGN TEST

JDC 12218 REV S PAGE 4 OF 46

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

(B) Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

(C) Set digit switches on Self Test Assembly to 00000.

(D) Self Test panel - Press to light SELF TEST pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

DATE ____

MANUAL LOAD PROCEDURES

4. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

(F) Programmer and Monitor panel -
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(G) RDC Interface panel -
Press to light CH33-10 pushbutton.

(H) XY Interface panel -
Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons.
Set AGC INPUT COUNTERS switch to 9.

(I) Programmer and Monitor panel -
Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code.
Press EXECUTE pushbutton.

4. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then perform the following operations:

a. Reload UPLINK tape in Tape Reader at beginning of tape.

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 1

5. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

6. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 7, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 1 ENTRY

7. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00001 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

b. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that tape advances to beginning of first UPLINK code.
c. Press EXECUTE pushbutton on Programmer and Monitor panel.
d. Repeat step 4.

INITIALIZATION POSITION 1

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

6. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

6A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 1 ENTRY

7. Press EXECUTE pushbutton on Programmer and Monitor panel.

7A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

8. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 9, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

9. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

10. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 11, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

7B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

7C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

8. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

9. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

10. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

11. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

12. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 13, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001

13. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

14. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 15,

CTS UPLINK TAPE LOAD PROCEDURES

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

12. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

14. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002

15. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

CTS UPLINK TAPE LOAD PROCEDURES

15. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

DATE ________

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

CTS UPLINK TAPE LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

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SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Enter VERB 34 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

31. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

32. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 33, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI and LO as required.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
c. Record Row 1 indication.

31. Press EXECUTE pushbutton on Programmer and Monitor panel.

32. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

32A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
To correct only Row 2: VERB 22 ENTR Site latitude from Table 1 ENTR	
TEST POSITION 2 ENTRY 33. Perform following DSKY operations: a. VERB 33 ENTR b. Observe: VERB 21 NOUN 30 Flashing c. +00002 ENTR d. Observe: VERB 22 NOUN 30 Flashing e. +00000 ENTR f. Observe: VERB 23 NOUN 30 Flashing g. +00001 ENTR	TEST POSITION 2 ENTRY 33. Press EXECUTE pushbutton on Programmer and Monitor panel. 33A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 33B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 33C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
YNB AZIMUTH AND ELEVATION 34. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +27000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 35, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +27000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001.	YNB AZIMUTH AND ELEVATION 34. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +27000 b. Row 2 shall display +00000 c. Row 3 shall display 00001.
35. Enter VERB 33 and press ENTR pushbutton on DSKY.	35. Press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
ZNB AZIMUTH AND ELEVATION 36. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 37, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00002.	ZNB AZIMUTH AND ELEVATION 36. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00002.
37. Enter VERB 33 and press ENTR pushbutton on DSKY.	37. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 1 DATA INSERTION 38. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 39, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001.	TARGET 1 DATA INSERTION 38. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00001.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
39. Enter VERB 33 and press ENTR pushbutton on DSKY.	39. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 2 DATA INSERTION 40. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 41, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00002.	TARGET 2 DATA INSERTION 40. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. Row 2 shall display +00000 c. Row 3 shall display 00002.
41. Enter VERB 33 and press ENTR pushbutton on DSKY.	41. Press EXECUTE pushbutton on Programmer and Monitor panel.
COARSE MARK STAR 1 42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding. 43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If	COARSE MARK STAR 1 42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding. 43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

DATE ________

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.	conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.
COARSE MARK STAR 2 44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding. 45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.	COARSE MARK STAR 2 44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding. 45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.
FINE MARK STAR 1 46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.	FINE MARK STAR 1 46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

DATE ________

MANUAL LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving bevore proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
c. Record Row 1 indication.

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MANUAL LOAD PROCEDURES

57. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00001 ENTR ENTR
d. 02543 ENTR
e. 00002 ENTR

TEST ENTRY

58. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

59. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 60, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 4 ENTRY

60. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

57. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing.

59A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 4 ENTRY

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

60A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

60B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 62, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

62. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 64, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR

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60C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

62. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

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MANUAL LOAD PROCEDURES

Row 3 shall display 00002.

64. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

65. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001.

66. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

67. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +22500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00002.

68. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

69. When VERB 06 NOUN 61 flash, insure that the DSKY displays on the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 70,

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64. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

65. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

66. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

67. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

68. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

69. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

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MANUAL LOAD PROCEDURES

if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

70. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

71. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 72, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

72. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

CTS UPLINK TAPE LOAD PROCEDURES

70. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

71. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

72. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

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MANUAL LOAD PROCEDURES

automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

77. The Stable Member will be coarse aligned to the desired test position. In

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automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

77. The Stable Member will be coarse aligned to the desired test position. In

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MANUAL LOAD PROCEDURES

approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 78 and 80.

78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 81, if not, press

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approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 78 and 80.

78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 81, if not, press

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MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0^{o} and 10^{o} as indicated by the trunnion TPAC.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value

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MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0^{o} and 10^{o} as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value is not within any set of limits, wait 30

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MANUAL LOAD PROCEDURES

is not within any set of limits, wait 30 minutes and then repeat this step.

88. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00000 ENTR ENTR
d. 02543 ENTR
e. 00001 ENTR

TEST ENTRY

89. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

90. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 91, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 5 ENTRY

91. Perform following DSKY operations:

a. VERB 33 ENTR

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minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
c. Record Row 1 indication.

88. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

89. Press EXECUTE pushbutton on Programmer and Monitor panel.

90. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

90A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 5 ENTRY

91. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 93, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

93. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

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91A. When VERB 21 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

91B. When VERB 22 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

91C. When VERB 23 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

93. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000

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MANUAL LOAD PROCEDURES

If displays are correct, proceed to step 95, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

95. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001.

97. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +00000 ENTR
c. VERB 22 ENTR
d. +89999 ENTR
e. Observe:
Row 3 displays 00002.

99. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

b. Row 2 shall display +00000
c. Row 3 shall display 00002.

95. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

97. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

99. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 101, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

101. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 103, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

101. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

MANUAL LOAD PROCEDURES

103. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are

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103. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are

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MANUAL LOAD PROCEDURES

satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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MANUAL LOAD PROCEDURES

optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

CTS UPLINK TAPE LOAD PROCEDURES

optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

MANUAL LOAD PROCEDURES

118. Perform following DSKY operations:

a. VERB 40 NOUN 20 ENTR
Wait 5 seconds
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

118. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR

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MANUAL LOAD PROCEDURES

123. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

124. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX. XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 125, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 3 ENTRY

125. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

b. 00003 ENTR
c. Record Row 1 indication.

123. Press EXECUTE pushbutton on Programmer and Monitor panel.

124. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

124A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 3 ENTRY

125. Press EXECUTE pushbutton on Programmer and Monitor panel.

125A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 127, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

127. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 129, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

129. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

127. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

129. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

COARSE MARK STAR 1

NOTE: Saturation of the cosecant amplifier can occur if the resolved mode is used when driving the SXT to angles less than 5 degrees. Insure that the OPTICS COUPLING switch is set to DIRECT prior to performance of step 130.

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

COARSE MARK STAR 1

NOTE: Saturation of the cosecant amplifier can occur if the resolved mode is used when driving the SXT to angles less than 5 degrees. Insure that the OPTICS COUPLING switch is set to DIRECT prior to performance of step 130.

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0° respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Perform following DSKY operations:

a. VERB 34 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR
j. 20000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR
n. VERB 21 NOUN 01 ENTR
o. 00362 ENTR
p. 16002 ENTR
q. VERB 25 NOUN 01 ENTR
r. 03770 ENTR
s. 10067 ENTR
t. 04317 ENTR
u. 01770 ENTR
v. VERB 25 NOUN 26 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.

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MANUAL LOAD PROCEDURES

w. 01000 ENTR
x. 01770 ENTR
y. 00007 ENTR
z. VERB 30 ENTR

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

144. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02444 ENTR
c. 20000 ENTR ENTR
d. 02456 ENTR
e. 57777 ENTR ENTR
f. 02457 ENTR
g. 77777 ENTR ENTR
h. 02462 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
c. Record Row 1 indication.

144. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

i. 20000 ENTR ENTR
j. 02543 ENTR
k. 00002 ENTR

TEST ENTRY

145. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

146. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 147, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 6 ENTRY

147. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00004 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

TEST ENTRY

145. When tape stops, press EXECUTE pushbutton on Programmer and Monitor panel.

146. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

146A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 6 ENTRY

147. Press EXECUTE pushbutton on Programmer and Monitor panel.

147A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
148. When VERB 21 NOUN 22 flash, perform following DSKY operations: a. +27000 ENTR b. Observe: VERB 22 NOUN 22 Flashing c. +31500 ENTR d. Observe: VERB 23 NOUN 22 Flashing e. +27000 ENTR	148. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 148A. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 148B. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 1 DATA INSERTION	TARGET 1 DATA INSERTION
149. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 150, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001.	149. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00001.
150. Enter VERB 33 and press ENTR pushbutton on DSKY.	150. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 2 DATA INSERTION	TARGET 2 DATA INSERTION
151. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 152,	151. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. Row 2 shall display +00000

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00002.	c. Row 3 shall display 00002.
152. Enter VERB 33 and press ENTR pushbutton on DSKY.	152. Press EXECUTE pushbutton on Programmer and Monitor panel.
COARSE MARK STAR 1	COARSE MARK STAR 1
153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.	153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.
154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.	154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.
COARSE MARK STAR 2	COARSE MARK STAR 2
155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's	155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.	indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.
156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.	156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.
FINE MARK STAR 1	FINE MARK STAR 1
157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.	157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.
NOTE: Minimize the time between MARKS taken in steps 158 and 160.	NOTE: Minimize the time between MARKS taken in steps 158 and 160.
158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.	158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
FINE MARK STAR 2	FINE MARK STAR 2
159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.	159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.
160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.	160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.
X PIPA ABOUT Z MISALIGNMENT	X PIPA ABOUT Z MISALIGNMENT
161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.	161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.
162. Enter VERB 33 and press ENTR pushbutton on DSKY.	162. Press EXECUTE pushbutton on Programmer and Monitor panel.
Z PIPA ABOUT X MISALIGNMENT	Z PIPA ABOUT X MISALIGNMENT
163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.	163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.
TEST TERMINATION	TEST TERMINATION
164. Perform following DSKY operations: a. VERB 34 ENTR b. Observe: PROG display indicates 00.	164. Press EXECUTE pushbutton on Programmer and Monitor panel. The PROG display on the DSKY shall indicate 00.

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MANUAL LOAD PROCEDURES

c. VERB 40 NOUN 20 ENTR
Wait 5 seconds
d. VERB 41 NOUN 20 ENTR
e. Observe:
VERB 21 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 22 NOUN 22 Flashing
h. +00000 ENTR
i. Observe:
q VERB 23 NOUN 22 Flashing
j. +00000 ENTR

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

CTS UPLINK TAPE LOAD PROCEDURES

164A. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

164B. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164C. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164D. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

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MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

168. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press MONITOR pushbutton. MONITOR pushbutton shall light and AGC INPUT-CTR pushbutton shall go out.

171. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

172. Press to extinguish SELF TEST pushbutton on Self Test panel.

173. Disconnect Self Test Assembly from Buffer Box Assembly. Connect cable W226 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12218
REV S
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ______ CAL DATE
NAME ________ SER. NO. ______ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
24	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			a
26	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			b
30	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12218
REV S

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30 (cont)			24000		27242			
			30000		33242			
			34000		37242			
50	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			c
52	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			d
56	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
81	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			e
83	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			f
87	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12218
REV. S

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
112	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			g
114	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			h
122	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
137	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			i
139	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			j
143	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
161	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			k

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12218
REV. S

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
163	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			l
167	Y PIPA about Z (Bias corrected)	arc sec	▨		▨			m
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			n
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			o
	Y PIPA about X (Bias corrected)	arc sec	▨		▨			p
	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			q
	Z PIPA about Y (Bias corrected)	arc sec	▨		▨			r
	X PIPA about Y (Bias corrected)	arc sec	▨		▨			s
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			t
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			u
	Z PIPA about X (Bias corrected)	arc sec	▨		▨			v
	X PIPA about Z (Bias corrected)	arc sec	▨		▨			w
	Z PIPA about X (Bias corrected)	arc	-150		+150			x

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12218
REV. S

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
167	Enter the latest values form JDC 12217 or JDC 12267

X PIPA Bias ____________ cm/sec^2

Y PIPA Bias ____________ cm/sec^2

Z PIPA Bias ____________ cm/sec^2

θ_X = 210 (X PIPA Bias) = ____________ arc sec

θ_Y = 210 (Y PIPA Bias) = ____________ arc sec

θ_Z = 210 (Z PIPA Bias) = ____________ arc sec

Line a - θ_Y = ____________ enter on line m

Line b - θ_Z = ____________ enter on line n

Line c - θ_X = ____________ enter on line o

Line d - θ_Y = ____________ enter on line p

Line e - θ_Y = ____________ enter on line q

Line f - θ_Z = ____________ enter on line r

Line g - θ_X = ____________ enter on line s

Line h - θ_Y = ____________ enter on line t

Line i - θ_X = ____________ enter on line u

Line j - θ_Z = ____________ enter on line v

Line k - θ_X = ____________ enter on line w

Line l - θ_Z = ____________ enter on line x

DATE ________

JOB G & N FINE ALIGN TEST | JDC 12218 REV. T PAGE 1 OF 46 | INITIAL TDRR 29882 D.S. PGS 1

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars). The SXT measures (cont)

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31945	7	-	EA	-
F	4-5-67	33491	1,5	1	EA	-
G	9-6-67	34560	1	-	EA	-
H	9-14-67	34610	1,3,4	-	EA	-
J	10-12-67	34831	1,3,5,6,7	4	EA	-
K	1-4-68	35362	1,7	-	EA	-
L	2-1-68	35549	7	-	EA	-
M	8-7-68	36673	All	All	EA	-
N	8-16-68	36701	38,39	-	EA	-
P	8-26-68	36715	24,46	-	EA	-
R	10-21-68	36928	3, 38-40	-	EA	-
S	12-3-68	37088	12,18,26,34, 36,37,39,42, 43,46	-	EA	-
T	3-11-69	37407	10,11,16,17, 23,24,30,32	-	EA	

REFERENCES

IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont): star angles with respect to Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment.

The X and Z Stable Member axis are in turn aligned to local vertical.

IMPORTANT: 1. To prevent erroneous test results, complete each test position within 25 minutes after entering that position.

2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

3. Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB G & N FINE ALIGN TEST | JDC 12218 REV T PAGE 2 OF 46

SUBSYSTEM G & N SYSTEM | ASSY

NOTE: 1. This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

DATE ________

JOB G & N FINE ALIGN TEST | JDC 12218 REV T PAGE 3 OF 46

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0^{o} and 10^{o} as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   - (1) OPTICS ZERO to OFF then to ZERO
   - (2) OPTICS TEL TRUN to SLAVE TO SXT
   - (3) OPTICS COUPLING to RSLV
   - (4) OPTICS MODE to MAN
   - (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   - (1) OPTICS MODE to MAN then to ZERO
   - (2) OPTICS CONTROLLER SPEED to LO
   - (3) OPTICS CONTROLLER COUPLING to RSLV
   - (4) OPTICS TRACKER to OFF
   - (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12218 CTS UPLINK Tape, P/N 2901648-002

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0^{o} and 10^{o} as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   - (1) OPTICS ZERO to OFF then to ZERO
   - (2) OPTICS TEL TRUN to SLAVE TO SXT
   - (3) OPTICS COUPLING to RSLV
   - (4) OPTICS MODE to MAN
   - (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   - (1) OPTICS MODE to MAN then to ZERO
   - (2) OPTICS CONTROLLER SPEED to LO
   - (3) OPTICS CONTROLLER COUPLING to RSLV
   - (4) OPTICS TRACKER to OFF
   - (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

DATE ________

JOB G & N FINE ALIGN TEST | JDC 12218 REV T PAGE 4 OF 46

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

(B) Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

(C) Set digit switches on Self Test Assembly to 00000.

(D) Self Test panel - Press to light SELF TEST pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

DATE ________

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	(F) Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons. (G) RDC Interface panel - Press to light CH33-10 pushbutton. (H) XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9. (I) Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.
4. Perform following DSKY operations: a. VERB 01 NOUN 10 ENTR b. 00003 ENTR Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.	4. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then perform the following operations: a. Reload UPLINK tape in Tape Reader at beginning of tape.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	b. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that tape advances to beginning of first UPLINK code. c. Press EXECUTE pushbutton on Programmer and Monitor panel. d. Repeat step 4.
INITIALIZATION POSITION 1 5. Perform following DSKY operations: a. VERB 57 ENTR b. 00003 ENTR	INITIALIZATION POSITION 1 5. Press EXECUTE pushbutton on Programmer and Monitor panel.
6. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +XX.XXX (Test site latitude from Table 1) If displays are correct, proceed to step 7, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR To correct only Row 2: VERB 22 ENTR Site latitude from Table 1 ENTR	6. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. VERB 22 shall be flashing 6A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.
TEST POSITION 1 ENTRY 7. Perform following DSKY operations: a. VERB 33 ENTR b. Observe: VERB 21 NOUN 30 Flashing c. +00001 ENTR	TEST POSITION 1 ENTRY 7. Press EXECUTE pushbutton on Programmer and Monitor panel. 7A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
d. Observe: VERB 22 NOUN 30 Flashing e. +00000 ENTR f. Observe: VERB 23 NOUN 30 Flashing g. +00001 ENTR	7B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 7C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
YNB AZIMUTH AND ELEVATION 8. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +27000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 9, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +27000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001.	YNB AZIMUTH AND ELEVATION 8. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +27000 b. Row 2 shall display +00000 c. Row 3 shall display 00001
9. Enter VERB 33 and press ENTR pushbutton on DSKY.	9. Press EXECUTE pushbutton on Programmer and Monitor panel.
ZNB AZIMUTH AND ELEVATION 10. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 11, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR	ZNB AZIMUTH AND ELEVATION 10. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00002

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00002.	
11. Enter VERB 33 and press ENTR pushbutton on DSKY.	11. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 1 DATA INSERTION 12. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 13, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001	TARGET 1 DATA INSERTION 12. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00001
13. Enter VERB 33 and press ENTR pushbutton on DSKY.	13. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 2 DATA INSERTION 14. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 15,	TARGET 2 DATA INSERTION 14. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. Row 2 shall display +00000 c. Row 3 shall display 00002

MANUAL LOAD PROCEDURES

if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002

15. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

CTS UPLINK TAPE LOAD PROCEDURES

15. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

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MANUAL LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

CTS UPLINK TAPE LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

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MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Enter VERB 34 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

31. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

32. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 33, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI and LO as required.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
c. Record Row 1 indication.

31. Press EXECUTE pushbutton on Programmer and Monitor panel.

32. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

32A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 2 ENTRY

33. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 35, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

35. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TEST POSITION 2 ENTRY

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

33A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

35. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 37, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

37. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 39, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

CTS UPLINK TAPE LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

37. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

MANUAL LOAD PROCEDURES

39. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 41, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

41. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

CTS UPLINK TAPE LOAD PROCEDURES

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

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MANUAL LOAD PROCEDURES

conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

CTS UPLINK TAPE LOAD PROCEDURES

conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

MANUAL LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving bevore proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

DATE ________

MANUAL LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
c. Record Row 1 indication.

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MANUAL LOAD PROCEDURES

57. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00001 ENTR ENTR
d. 02543 ENTR
e. 00002 ENTR

TEST ENTRY

58. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

59. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 60, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 4 ENTRY

60. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

57. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing.

59A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 4 ENTRY

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

60A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

60B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES

f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 62, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

62. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 64, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

60C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

62. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Row 3 shall display 00002.	
64. Enter VERB 33 and press ENTR pushbutton on DSKY.	64. Press EXECUTE pushbutton on Programmer and Monitor panel.
YSM DESIRED INSERTION	YSM DESIRED INSERTION
65. When VERB 06 NOUN 61 flash, perform following DSKY operations: a. VERB 21 ENTR b. +13500 ENTR c. VERB 22 ENTR d. +00000 ENTR e. Observe: Row 3 displays 00001.	65. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.
66. Enter VERB 33 and press ENTR pushbutton on DSKY.	66. Press EXECUTE pushbutton on Programmer and Monitor panel.
ZSM DESIRED INSERTION	ZSM DESIRED INSERTION
67. When VERB 06 NOUN 61 flash, perform following DSKY operations: a. VERB 21 ENTR b. +22500 ENTR c. VERB 22 ENTR d. +00000 ENTR e. Observe: Row 3 displays 00002.	67. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.
68. Enter VERB 33 and press ENTR pushbutton on DSKY.	68. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 1 DATA INSERTION	TARGET 1 DATA INSERTION
69. When VERB 06 NOUN 61 flash, insure that the DSKY displays on the following: a. Row 1 displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 70,	69. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00001.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001.	
70. Enter VERB 33 and press ENTR pushbutton on DSKY.	70. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 2 DATA INSERTION	TARGET 2 DATA INSERTION
71. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 72, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00002.	71. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. Row 2 shall display +00000 c. Row 3 shall display 00002.
72. Enter VERB 33 and press ENTR pushbutton on DSKY.	72. Press EXECUTE pushbutton on Programmer and Monitor panel.
COARSE MARK STAR 1	COARSE MARK STAR 1
73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will	73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.	automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.
74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.	74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.
COARSE MARK STAR 2	COARSE MARK STAR 2
75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.	75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.
76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.	76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.
FINE MARK STAR 1	FINE MARK STAR 1
77. The Stable Member will be coarse aligned to the desired test position. In	77. The Stable Member will be coarse aligned to the desired test position. In

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding. NOTE: Minimize the time between MARKS taken in steps 78 and 80.	approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding. NOTE: Minimize the time between MARKS taken in steps 78 and 80.
78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.	78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.
FINE MARK STAR 2	FINE MARK STAR 2
79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.	79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.
80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 81, if not, press	80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 81, if not, press

MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0^{o} and 10^{o} as indicated by the trunnion TPAC.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value

CTS UPLINK TAPE LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

82. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

84. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 5

85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0^{o} and 10^{o} as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

87. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value is not within any set of limits, wait 30

MANUAL LOAD PROCEDURES

is not within any set of limits, wait 30 minutes and then repeat this step.

88. Perform following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 02542 ENTR
c. 00000 ENTR ENTR
d. 02543 ENTR
e. 00001 ENTR

TEST ENTRY

89. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

90. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 91, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 5 ENTRY

91. Perform following DSKY operations:
a. VERB 33 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

minutes and then perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
c. Record Row 1 indication.

88. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

89. Press EXECUTE pushbutton on Programmer and Monitor panel.

90. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

90A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 5 ENTRY

91. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

b. Observe:
VERB 21 NOUN 30 Flashing
c. +00005 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 93, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

93. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

CTS UPLINK TAPE LOAD PROCEDURES

91A. When VERB 21 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

91B. When VERB 22 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

91C. When VERB 23 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

92. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

93. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

94. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000

MANUAL LOAD PROCEDURES

If displays are correct, proceed to step 95, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

95. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, perform following DSKY operations:
a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001.

97. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, perform following DSKY operations:
a. VERB 21 ENTR
b. +00000 ENTR
c. VERB 22 ENTR
d. +89999 ENTR
e. Observe:
Row 3 displays 00002.

99. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

b. Row 2 shall display +00000
c. Row 3 shall display 00002.

95. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

96. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

97. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

98. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

99. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 101, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

101. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 103, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

101. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

MANUAL LOAD PROCEDURES

103. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK push- on Indicator Control panel. If conditions are

CTS UPLINK TAPE LOAD PROCEDURES

103. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK push- on Indicator Control panel. If conditions are

MANUAL LOAD PROCEDURES

satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

MANUAL LOAD PROCEDURES

optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

CTS UPLINK TAPE LOAD PROCEDURES

optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

MANUAL LOAD PROCEDURES

118. Perform following DSKY operations:

a. VERB 40 NOUN 20 ENTR
Wait 5 seconds
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

118. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR

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MANUAL LOAD PROCEDURES

123. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

124. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX. XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 125, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 3 ENTRY

125. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

b. 00003 ENTR
c. Record Row 1 indication.

123. Press EXECUTE pushbutton on Programmer and Monitor panel.

124. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

124A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 3 ENTRY

125. Press EXECUTE pushbutton on Programmer and Monitor panel.

125A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ________

MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 127, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

127. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 129, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

129. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

127. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

129. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

COARSE MARK STAR 1

NOTE: Saturation of the cosecant amplifier can occur if the resolved mode is used when driving the SXT to angles less than 5 degrees. Insure that the OPTICS COUPLING switch is set to DIRECT prior to performance of step 130.

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

COARSE MARK STAR 1

NOTE: Saturation of the cosecant amplifier can occur if the resolved mode is used when driving the SXT to angles less than 5 degrees. Insure that the OPTICS COUPLING switch is set to DIRECT prior to performance of step 130.

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0° respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Perform following DSKY operations:

a. VERB 34 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR
j. 20000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR
n. VERB 21 NOUN 01 ENTR
o. 00362 ENTR
p. 16002 ENTR
q. VERB 25 NOUN 01 ENTR
r. 03770 ENTR
s. 10067 ENTR
t. 04317 ENTR
u. 01770 ENTR
v. VERB 25 NOUN 26 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.

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MANUAL LOAD PROCEDURES

w. 01000 ENTR
x. 01770 ENTR
y. 00007 ENTR
z. VERB 30 ENTR

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

144. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02444 ENTR
c. 20000 ENTR ENTR
d. 02456 ENTR
e. 57777 ENTR ENTR
f. 02457 ENTR
g. 77777 ENTR ENTR
h. 02462 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
c. Record Row 1 indication.

144. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

i. 20000 ENTR ENTR
j. 02543 ENTR
k. 00002 ENTR

TEST ENTRY

145. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

146. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 147, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 6 ENTRY

147. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00004 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

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TEST ENTRY

145. When tape stops, press EXECUTE pushbutton on Programmer and Monitor panel.

146. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

146A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 6 ENTRY

147. Press EXECUTE pushbutton on Programmer and Monitor panel.

147A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

148. When VERB 21 NOUN 22 flash, perform following DSKY operations:

a. +27000 ENTR
b. Observe:
VERB 22 NOUN 22 Flashing
c. +31500 ENTR
d. Observe:
VERB 23 NOUN 22 Flashing
e. +27000 ENTR

TARGET 1 DATA INSERTION

149. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 150, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

150. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

151. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 152,

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148. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

148A. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

148B. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

149. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

150. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

151. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000

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MANUAL LOAD PROCEDURES

if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

152. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.

154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's

CTS UPLINK TAPE LOAD PROCEDURES

c. Row 3 shall display 00002.

152. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.

154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's

DATE ______

MANUAL LOAD PROCEDURES

indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.

NOTE: Minimize the time between MARKS taken in steps 158 and 160.

158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.

NOTE: Minimize the time between MARKS taken in steps 158 and 160.

158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

DATE ______

MANUAL LOAD PROCEDURES

FINE MARK STAR 2

159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

162. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

164. Perform following DSKY operations:

a. VERB 34 ENTR
b. Observe:
PROG display indicates 00.

CTS UPLINK TAPE LOAD PROCEDURES

FINE MARK STAR 2

159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

162. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

164. Press EXECUTE pushbutton on Programmer and Monitor panel. The PROG display on the DSKY shall indicate 00.

DATE ______

MANUAL LOAD PROCEDURES

c. VERB 40 NOUN 20 ENTR
Wait 5 seconds
d. VERB 41 NOUN 20 ENTR
e. Observe:
VERB 21 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 22 NOUN 22 Flashing
h. +00000 ENTR
i. Observe:
q VERB 23 NOUN 22 Flashing
j. +00000 ENTR

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

CTS UPLINK TAPE LOAD PROCEDURES

164A. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

164B. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164C. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164D. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

DATE ________

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

168. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press MONITOR pushbutton. MONITOR pushbutton shall light and AGC INPUT-CTR pushbutton shall go out.

171. Set Power switch on Tape Reader to OFF and remove tape: If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

172. Press to extinguish SELF TEST pushbutton on Self Test panel.

173. Disconnect Self Test Assembly from Buffer Box Assembly. Connect cable W226 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12218
REV T
INITIAL TDRR 29982

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ________ CAL DATE
NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
24	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			a
26	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			b
30	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12218
REV. T

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30 (cont)			24000		27242			
			30000		33242			
			34000		37242			
50	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			c
52	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			d
56	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
81	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			e
83	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			f
87	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 5

JDC
NO. 12218
REV. T

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	AC	
112	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			g
114	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			h
122	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
137	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			i
139	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			j
143	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
161	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			k

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 5

JDC
NO. 12218
REV. T

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
163	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			l
167	Y PIPA about Z (Bias corrected)	arc sec	▨		▨			m
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			n
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			o
	Y PIPA about X (Bias corrected)	arc sec	▨		▨			p
	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			q
	Z PIPA about Y (Bias corrected)	arc sec	▨		▨			r
	X PIPA about Y (Bias corrected)	arc sec	▨		▨			s
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			t
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			u
	Z PIPA about X (Bias corrected)	arc sec	▨		▨			v
	X PIPA about Z (Bias corrected)	arc sec	▨		▨			w
	Z PIPA about X (Bias corrected)	arc	-150		+150			x

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 **OF** 5

JDC
NO. 1221
REV. T

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
167	Enter the latest values form JDC 12217 or JDC 12267

X PIPA Bias ________________ cm/sec^2

Y PIPA Bias ________________ cm/sec^2

Z PIPA Bias ________________ cm/sec^2

θ_X = 210 (X PIPA Bias) = ________________ arc sec

θ_Y = 210 (Y PIPA Bias) = ________________ arc sec

θ_Z = 210 (Z PIPA Bias) = ________________ arc sec

Line a - θ_Y = ________________ enter on line m

Line b - θ_Z = ________________ enter on line n

Line c - θ_X = ________________ enter on line o

Line d - θ_Y = ________________ enter on line p

Line e - θ_Y = ________________ enter on line q

Line f - θ_Z = ________________ enter on line r

Line g - θ_X = ________________ enter on line s

Line h - θ_Y = ________________ enter on line t

Line i - θ_X = ________________ enter on line u

Line j - θ_Z = ________________ enter on line v

Line k - θ_X = ________________ enter on line w

Line l - θ_Z = ________________ enter on line x

DATE ________

JOB G & N FINE ALIGN TEST

JDC 12218 **REV.** U **PAGE** 1 **OF** 47

INITIAL TDRR 29882 **D.S. PGS** 5

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars). The SXT measures (cont)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30309	6,7	-	EA	WS
B	9-1-66	30927	7	-	JP	-
C	10-20-66	31615	1	-	EA	-
D	11-10-66	31897	1,7	1	EA	-
E	11-15-66	31943	7	-	EA	-
F	4-5-67	33491	1,5	1	EA	-
G	9-6-67	34560	1	-	EA	-
H	9-14-67	34610	1,3,4	-	EA	-
J	10-12-67	34831	1,3,5,6,7	4	EA	-
K	1-4-68	35362	1,7	-	EA	-
L	2-1-68	35549	7	-	EA	-
M	8-7-68	36673	All	All	EA	-
N	8-16-68	36701	38,39	-	EA	-
P	8-26-68	36715	24,46	-	EA	-
R	10-21-68	36928	3,38-40	-	EA	-
S	12-3-68	37088	12,18,26,34, 36,37,39,42, 43,46	-	EA	-
T	3-11-69	37407	10,11,16,17, 23,24,30,32	-	EA	
U	5-26-70	38129	2, 33, 45	-	EA	-

REFERENCES

IMPORTANT 1. To prevent erroneous test results, complete each test position (Cont. below)

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont): star angles with respect to Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment.

The X and Z Stable Member axis are in turn aligned to local vertical.

IMPORTANT: 1. To prevent erroneous test results, complete each test position within 25 minutes after entering that position.

2. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB G & N FINE ALIGN TEST

JDC 12218 **REV** U **PAGE** 2 **OF** 47

SUBSYSTEM G & N SYSTEM

ASSY

3. Insure that cable W226 is removed and connector assembly (2003099) or Restart Monitor module (2898989) is connected to CGC test connector.

NOTE: 1. This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

DATE ________

JOB G & N FINE ALIGN TEST

JDC 12218 **REV** U **PAGE** 3 **OF** 47

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   - (1) OPTICS ZERO to OFF then to ZERO
   - (2) OPTICS TEL TRUN to SLAVE TO SXT
   - (3) OPTICS COUPLING to RSLV
   - (4) OPTICS MODE to MAN
   - (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   - (1) OPTICS MODE to MAN then to ZERO
   - (2) OPTICS CONTROLLER SPEED to LO
   - (3) OPTICS CONTROLLER COUPLING to RSLV
   - (4) OPTICS TRACKER to OFF
   - (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12218 CTS UPLINK Tape, P/N 2901648-002

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Press to light OPTICS POWER ON pushbutton on Test Control panel.

2. Using the Optics Hand Controller, position the SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

3. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set:
   - (1) OPTICS ZERO to OFF then to ZERO
   - (2) OPTICS TEL TRUN to SLAVE TO SXT
   - (3) OPTICS COUPLING to RSLV
   - (4) OPTICS MODE to MAN
   - (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set:
   - (1) OPTICS MODE to MAN then to ZERO
   - (2) OPTICS CONTROLLER SPEED to LO
   - (3) OPTICS CONTROLLER COUPLING to RSLV
   - (4) OPTICS TRACKER to OFF
   - (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

DATE ________

JOB G & N FINE ALIGN TEST

JDC 12218 **REV** U **PAGE** 4 **OF** 47

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

(B) Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

(C) Set digit switches on Self Test Assembly to 00000.

(D) Self Test panel - Press to light SELF TEST pushbutton.

(E) Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

DATE ________

MANUAL LOAD PROCEDURES

4. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

(F) Programmer and Monitor panel -
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.
(G) RDC Interface panel -
Press to light CH33-10 pushbutton.
(H) XY Interface panel -
Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons.
Set AGC INPUT COUNTERS switch to 9.
(I) Programmer and Monitor panel -
Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code.
Press EXECUTE pushbutton.

4. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed with the test. If recorded value is not within any set of limits, wait 30 minutes and then perform the following operations:

a. Reload UPLINK tape in Tape Reader at beginning of tape.

DATE ____________

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 1

5. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

6. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 7, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 1 ENTRY

7. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00001 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

b. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that tape advances to beginning of first UPLINK code.
c. Press EXECUTE pushbutton on Programmer and Monitor panel.
d. Repeat step 4.

INITIALIZATION POSITION 1

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

6. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

6A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 1 ENTRY

7. Press EXECUTE pushbutton on Programmer and Monitor panel.

7A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ____________

MANUAL LOAD PROCEDURES

d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

8. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 9, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

9. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

10. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 11, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

7B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

7C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

8. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

9. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

10. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002

DATE ____________

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

11. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

12. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 13, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001

13. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

14. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 15,

CTS UPLINK TAPE LOAD PROCEDURES

11. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

12. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

14. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002

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MANUAL LOAD PROCEDURES

If not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002

15. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

CTS UPLINK TAPE LOAD PROCEDURES

15. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

16. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

17. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 18, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

18. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically

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MANUAL LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

CTS UPLINK TAPE LOAD PROCEDURES

align the SXT to target #4 location. Wait until optics stop driving before proceeding.

19. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 20, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

20. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 21 and 23.

21. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 22, if not, press

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MANUAL LOAD PROCEDURES

MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Enter VERB 34 and press ENTR pushbutton on DSKY.

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MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

22. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

23. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 24, if not, press MARK REJECT pushbutton and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

24. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT Y MISALIGNMENT

26. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0^{o} and 10^{o} as indicated by the trunnion TPAC.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

31. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00003 ENTR

32. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 33, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

INITIALIZATION POSITION 2

28. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0^{o} and 10^{o} as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI and LO as required.

29. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

30. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 31. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
c. Record Row 1 indication.

31. Press EXECUTE pushbutton on Programmer and Monitor panel.

32. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. VERB 22 shall be flashing

32A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

MANUAL LOAD PROCEDURES

To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 2 ENTRY

33. Perform following DSKY operations:
a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00002 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +27000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 35, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+27000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

35. Enter VERB 33 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

TEST POSITION 2 ENTRY

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

33A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

33C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

34. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +27000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

35. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 37, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

37. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 39, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

CTS UPLINK TAPE LOAD PROCEDURES

ZNB AZIMUTH AND ELEVATION

36. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

37. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

38. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

MANUAL LOAD PROCEDURES

39. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:
a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 41, if not, perform following DSKY operations:
To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

41. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

CTS UPLINK TAPE LOAD PROCEDURES

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

40. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:
a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

42. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

43. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If

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MANUAL LOAD PROCEDURES

conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

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conditions are satisfactory, press ENTR pushbutton and proceed to step 44, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

44. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

45. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 46, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

46. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

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MANUAL LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving bevore proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Minimize the time between MARKS taken in steps 47 and 49.

47. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 48, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

48. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

49. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 50, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Y MISALIGNMENT

50. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

51. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

52. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

53. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 4

54. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

55. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

56. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 57. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00003 ENTR

c. Record Row 1 indication.

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MANUAL LOAD PROCEDURES

57. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02542 ENTR

c. 00001 ENTR ENTR

d. 02543 ENTR

e. 00002 ENTR

TEST ENTRY

58. Perform following DSKY operations:

a. VERB 57 ENTR

b. 00003 ENTR

59. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500

b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 60, if not, perform following DSKY operations:

To correct only Row 1:

VERB 21 ENTR

+13500 ENTR

To correct only Row 2:

VERB 22 ENTR

Site latitude from Table 1 ENTR

TEST POSITION 4 ENTRY

60. Perform following DSKY operations:

a. VERB 33 ENTR

b. Observe:

VERB 21 NOUN 30 Flashing

c. +00005 ENTR

d. Observe:

VERB 22 NOUN 30 Flashing

e. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

57. Press EXECUTE pushbutton on Programmer and Monitor panel.

TEST ENTRY

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500

b. VERB 22 shall be flashing.

59A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 4 ENTRY

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

60A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

60B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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f. Observe:

VERB 23 NOUN 30 Flashing

g. +00001 ENTR

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +27000

b. Row 2 displays +00000

c. Row 3 displays 00001

If displays are correct, proceed to step 62, if not, perform following DSKY operations:

To correct only Row 1:

VERB 21 ENTR

+27000 ENTR

To correct only Row 2:

VERB 22 ENTR

+00000 ENTR

Row 3 shall display 00001.

62. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000

b. Row 2 displays +00000

c. Row 3 displays 00002

If displays are correct, proceed to step 64, if not, perform following DSKY operations:

To correct only Row 1:

VERB 21 ENTR

+18000 ENTR

To correct only Row 2:

VERB 22 ENTR

+00000 ENTR

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60C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

YNB AZIMUTH AND ELEVATION

61. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +27000

b. Row 2 shall display +00000

c. Row 3 shall display 00001.

62. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZNB AZIMUTH AND ELEVATION

63. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000

b. Row 2 shall display +00000

c. Row 3 shall display 00002.

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Row 3 shall display 00002.

64. Enter VERB 33 and press ENTR pushbutton on DSKY.

YSM DESIRED INSERTION

65. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +13500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00001.

66. Enter VERB 33 and press ENTR pushbutton on DSKY.

ZSM DESIRED INSERTION

67. When VERB 06 NOUN 61 flash, perform following DSKY operations:

a. VERB 21 ENTR
b. +22500 ENTR
c. VERB 22 ENTR
d. +00000 ENTR
e. Observe:
Row 3 displays 00002.

68. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 1 DATA INSERTION

69. When VERB 06 NOUN 61 flash, insure that the DSKY displays on the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 70,

CTS UPLINK TAPE LOAD PROCEDURES

64. Press EXECUTE pushbutton on Programmer and Monitor panel.

YSM DESIRED INSERTION

65. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.

66. Press EXECUTE pushbutton on Programmer and Monitor panel.

ZSM DESIRED INSERTION

67. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.

68. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 1 DATA INSERTION

69. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

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MANUAL LOAD PROCEDURES

if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

70. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

71. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 72, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

72. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

CTS UPLINK TAPE LOAD PROCEDURES

70. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

71. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

72. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

73. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will

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MANUAL LOAD PROCEDURES

automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

77. The Stable Member will be coarse aligned to the desired test position. In

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automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

74. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 75, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

75. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

76. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 77, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

77. The Stable Member will be coarse aligned to the desired test position. In

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MANUAL LOAD PROCEDURES

approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 78 and 80.

78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 81, if not, press

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approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 78 and 80.

78. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 79, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

79. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

80. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 81, if not, press

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
MARK REJECT pushbutton and repeat this step.	MARK REJECT pushbutton and repeat this step.
Y PIPA ABOUT Z MISALIGNMENT	Y PIPA ABOUT Z MISALIGNMENT
81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.	81. In approximately 10 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.
82. Enter VERB 33 and press ENTR pushbutton on DSKY.	82. Press EXECUTE pushbutton on Programmer and Monitor panel.
Z PIPA ABOUT Y MISALIGNMENT	Z PIPA ABOUT Y MISALIGNMENT
83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.	83. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.
84. Enter VERB 34 and press ENTR pushbutton on DSKY.	84. Press EXECUTE pushbutton on Programmer and Monitor panel.
INITIALIZATION POSITION 5	INITIALIZATION POSITION 5
85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.	85. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.
86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.	86. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.
87. Perform following DSKY operations: a. VERB 01 NOUN 10 ENTR b. 00003 ENTR Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value	87. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 88. If recorded value is not within any set of limits, wait 30

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
is not within any set of limits, wait 30 minutes and then repeat this step.	minutes and then perform following DSKY operations: a. VERB 01 NOUN 10 ENTR b. 00003 ENTR c. Record Row 1 indication.
88. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 02542 ENTR c. 00000 ENTR ENTR d. 02543 ENTR e. 00001 ENTR	88. Press EXECUTE pushbutton on Programmer and Monitor panel.
TEST ENTRY	TEST ENTRY
89. Perform following DSKY operations: a. VERB 57 ENTR b. 00003 ENTR	89. Press EXECUTE pushbutton on Programmer and Monitor panel.
90. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +XX.XXX (Test site latitude from Table 1) If displays are correct, proceed to step 91, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR To correct only Row 2: VERB 22 ENTR Site latitude from Table 1 ENTR	90. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. VERB 22 shall be flashing 90A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.
TEST POSITION 5 ENTRY	TEST POSITION 5 ENTRY
91. Perform following DSKY operations: a. VERB 33 ENTR	91. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
b. Observe: VERB 21 NOUN 30 Flashing c. +00005 ENTR d. Observe: VERB 22 NOUN 30 Flashing e. +00000 ENTR f. Observe: VERB 23 NOUN 30 Flashing g. +00001 ENTR	91A. When VERB 21 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel. 91B. When VERB 22 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel. 91C. When VERB 23 NOUN 30 flash, press EXECUTE pushbutton on Programmer and Monitor panel.
YNB AZIMUTH AND ELEVATION	YNB AZIMUTH AND ELEVATION
92. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +27000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 93, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +27000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001.	92. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +27000 b. Row 2 shall display +00000 c. Row 3 shall display 00001.
93. Enter VERB 33 and press ENTR pushbutton on DSKY.	93. Press EXECUTE pushbutton on Programmer and Monitor panel.
ZNB AZIMUTH AND ELEVATION	ZNB AZIMUTH AND ELEVATION
94. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00002	94. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
If displays are correct, proceed to step 95, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00002.	b. Row 2 shall display +00000 c. Row 3 shall display 00002.
95. Enter VERB 33 and press ENTR pushbutton on DSKY.	95. Press EXECUTE pushbutton on Programmer and Monitor panel.
YSM DESIRED INSERTION	YSM DESIRED INSERTION
96. When VERB 06 NOUN 61 flash, perform following DSKY operations: a. VERB 21 ENTR b. +13500 ENTR c. VERB 22 ENTR d. +00000 ENTR e. Observe: Row 3 displays 00001.	96. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00001.
97. Enter VERB 33 and press ENTR pushbutton on DSKY.	97. Press EXECUTE pushbutton on Programmer and Monitor panel.
ZSM DESIRED INSERTION	ZSM DESIRED INSERTION
98. When VERB 06 NOUN 61 flash, perform following DSKY operations: a. VERB 21 ENTR b. +00000 ENTR c. VERB 22 ENTR d. +89999 ENTR e. Observe: Row 3 displays 00002.	98. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. Row 3 on DSKY shall display 00002.
99. Enter VERB 33 and press ENTR pushbutton on DSKY.	99. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 101, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

101. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 103, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

CTS UPLINK TAPE LOAD PROCEDURES

TARGET 1 DATA INSERTION

100. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

101. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

102. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

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MANUAL LOAD PROCEDURES

103. Enter VERB 33 and press ENTR pushbutton on DSKY.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK push- on Indicator Control panel. If conditions are

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103. Press EXECUTE pushbutton on Programmer and Monitor panel.

COARSE MARK STAR 1

104. When VERB 51 NOUN 30 flash, set OPTICS ZERO switch (on Indicator Control panel 2021290 only) to OFF then set OPTICS MODE switch to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

105. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 106, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

106. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

107. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK push- on Indicator Control panel. If conditions are

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satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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satisfactory, press ENTR pushbutton and proceed to step 108, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 1

108. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 NOUN 30 shall flash. Set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #1 location. Wait until optics stop driving before proceeding.

NOTE: Minimize the time between MARKS taken in steps 109 and 111.

109. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 110, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

110. When VERB 51 NOUN 30 flash, set OPTICS MODE switch on Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4 location. Wait until optics stop driving before proceeding.

111. Set OPTICS MODE switch to MAN. Using Optics Hand Controller, drive the

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MANUAL LOAD PROCEDURES

optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Enter VERB 33 and press ENTR pushbutton on DSKY.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Enter VERB 34 and press ENTR pushbutton on DSKY.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

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optics until the center dot of target #4 is centered in the SXT star line-of-sight reticle. Press MARK pushbutton on Indicator Control panel. If conditions are satisfactory, press ENTR pushbutton and proceed to step 112, if not, press MARK REJECT pushbutton and repeat this step.

X PIPA ABOUT Y MISALIGNMENT

112. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

113. Press EXECUTE pushbutton on Programmer and Monitor panel.

Y PIPA ABOUT X MISALIGNMENT

114. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

115. Press EXECUTE pushbutton on Programmer and Monitor panel.

INITIALIZATION POSITION 3

116. Using Optics Hand Controller on Indicator Control panel, position the SXT trunnion between 0^o and 10^o as indicated by the trunnion TPAC. Set OPTICS SPEED switch to HI or LO as required.

117. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

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SUBSYSTEM G & N SYSTEM ASSY

MANUAL LOAD PROCEDURES

118. Perform following DSKY operations:

a. VERB 40 NOUN 20 ENTR
Wait 5 seconds
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +0000 ENTR

CAUTION: Use extreme care when tilting G & N Mounting Fixture to insure that components do not strike cradle locking handles.

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

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118. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

CAUTION: Use extreme care when tilting G & N Mounting Fixture to insure that components do not strike cradle locking handles.

119. Set the G & N Mounting Fixture tilt axis to 0°. Take care not to strain or break hoses or cables.

120. Using Optics Hand Controller on Indicator Control panel, drive the SXT shaft to -90° as indicated on the shaft TPAC. (Set OPTICS SPEED switch to HI and LO as required.) Insure the trunnion TPAC indicates 0°.

121. Adjust the G & N Mounting Fixture tilt axis until the SXT central horizontal reticle line is centered on the horizontal reticle line of target #1.

122. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 123. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR

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[illegible] - 2/23/70 - [illegible]

SUBSYSTEM G & N SYSTEM ASSY

MANUAL LOAD PROCEDURES

123. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

124. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 125, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude from Table 1 ENTR

TEST POSITION 3 ENTRY

125. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00003 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

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b. 00003 ENTR

c. Record Row 1 indication.

123. Press EXECUTE pushbutton on Programmer and Monitor panel.

124. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

124A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 3 ENTRY

125. Press EXECUTE pushbutton on Programmer and Monitor panel.

125A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

125C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM G & N SYSTEM ASSY

MANUAL LOAD PROCEDURES

TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +18000
b. Row 2 displays +00000
c. Row 3 displays 00001

If displays are correct, proceed to step 127, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+18000 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00001.

127. Enter VERB 33 and press ENTR pushbutton on DSKY.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +00000
c. Row 3 displays 00002

If displays are correct, proceed to step 129, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
+00000 ENTR
Row 3 shall display 00002.

129. Enter VERB 33 and press ENTR pushbutton on DSKY.

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TARGET 1 DATA INSERTION

126. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +18000
b. Row 2 shall display +00000
c. Row 3 shall display 00001.

127. Press EXECUTE pushbutton on Programmer and Monitor panel.

TARGET 2 DATA INSERTION

128. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. Row 2 shall display +00000
c. Row 3 shall display 00002.

129. Press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM G & N SYSTEM ASSY

MANUAL LOAD PROCEDURES

COARSE MARK STAR 1

NOTE: Saturation of the cosecant amplifier can occur if the resolved mode is used when driving the SXT to angles less than 5 degrees. Insure that the OPTICS COUPLING switch is set to DIRECT prior to performance of step 130.

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

COARSE MARK STAR 1

NOTE: Saturation of the cosecant amplifier can occur if the resolved mode is used when driving the SXT to angles less than 5 degrees. Insure that the OPTICS COUPLING switch is set to DIRECT prior to performance of step 130.

130. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 131, if not, press MARK REJECT pushbutton and repeat this step.

COARSE MARK STAR 2

131. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

132. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 133, if not, press MARK REJECT pushbutton and repeat this step.

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MANUAL LOAD PROCEDURES

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

CTS UPLINK TAPE LOAD PROCEDURES

FINE MARK STAR 1

133. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.

NOTE: Minimize the time between MARKS taken in steps 134 and 136.

134. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 135, if not, press MARK REJECT pushbutton and repeat this step.

FINE MARK STAR 2

135. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0° respectively. Set OPTICS COUPLING switch to RSLV.

136. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 137, if not, press MARK REJECT pushbutton and repeat this step.

DATE ____________

MANUAL LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Enter VERB 33 and press ENTR pushbutton on DSKY.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Perform following DSKY operations:

a. VERB 34 ENTR
b. VERB 21 NOUN 01 ENTR
c. 03700 ENTR
d. 33663 ENTR
e. NOUN 15 ENTR
f. 55426 ENTR ENTR
g. 04064 ENTR ENTR
h. 15374 ENTR
i. VERB 25 NOUN 26 ENTR
j. 20000 ENTR
k. 01700 ENTR
l. 12007 ENTR
m. VERB 30 ENTR
n. VERB 21 NOUN 01 ENTR
o. 00362 ENTR
p. 16002 ENTR
q. VERB 25 NOUN 01 ENTR
r. 03770 ENTR
s. 10067 ENTR
t. 04317 ENTR
u. 01770 ENTR
v. VERB 25 NOUN 26 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

X PIPA ABOUT Z MISALIGNMENT

137. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.

138. Press EXECUTE pushbutton on Programmer and Monitor panel.

Z PIPA ABOUT X MISALIGNMENT

139. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

140. Press EXECUTE pushbutton on Programmer and Monitor panel. When tape stops, press EXECUTE pushbutton again.

DATE ____________

MANUAL LOAD PROCEDURES

w. 01000 ENTR
x. 01770 ENTR
y. 00007 ENTR
z. VERB 30 ENTR

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR

Record Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then repeat this step.

144. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02444 ENTR
c. 20000 ENTR ENTR
d. 02456 ENTR
e. 57777 ENTR ENTR
f. 02457 ENTR
g. 77777 ENTR ENTR
h. 02462 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

INITIALIZATION POSITION 6

141. Using Optics Hand Controller on Indicator Control panel, position SXT trunnion between 0° and 10° as indicated by the trunnion TPAC.

142. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

143. Press EXECUTE pushbutton on Programmer and Monitor panel. Record the DSKY Row 1 indication. If recorded value is within any set of limits given on Data Sheet, proceed to step 144. If recorded value is not within any set of limits, wait 30 minutes and then perform following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00003 ENTR
c. Record Row 1 indication.

144. Press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ____________

MANUAL LOAD PROCEDURES

i. 20000 ENTR ENTR
j. 02543 ENTR
k. 00002 ENTR

TEST ENTRY

145. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00003 ENTR

146. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

If displays are correct, proceed to step 147, if not, perform following DSKY operations:

To correct only Row 1:
VERB 21 ENTR
+13500 ENTR
To correct only Row 2:
VERB 22 ENTR
Site latitude
from Table 1 ENTR

TEST POSITION 6 ENTRY

147. Perform following DSKY operations:

a. VERB 33 ENTR
b. Observe:
VERB 21 NOUN 30 Flashing
c. +00004 ENTR
d. Observe:
VERB 22 NOUN 30 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 30 Flashing
g. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

TEST ENTRY

145. When tape stops, press EXECUTE pushbutton on Programmer and Monitor panel.

146. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following:

a. Row 1 shall display +13500
b. VERB 22 shall be flashing

146A. Enter Site latitude from Table 1 into DSKY and press ENTR pushbutton.

TEST POSITION 6 ENTRY

147. Press EXECUTE pushbutton on Programmer and Monitor panel.

147A. When VERB 21 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147B. When VERB 22 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

147C. When VERB 23 NOUN 30 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

DATE ____________

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
148. When VERB 21 NOUN 22 flash, perform following DSKY operations: a. +27000 ENTR b. Observe: VERB 22 NOUN 22 Flashing c. +31500 ENTR d. Observe: VERB 23 NOUN 22 Flashing e. +27000 ENTR	148. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 148A. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 148B. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 1 DATA INSERTION	TARGET 1 DATA INSERTION
149. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +18000 b. Row 2 displays +00000 c. Row 3 displays 00001 If displays are correct, proceed to step 150, if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +18000 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00001.	149. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +18000 b. Row 2 shall display +00000 c. Row 3 shall display 00001.
150. Enter VERB 33 and press ENTR pushbutton on DSKY.	150. Press EXECUTE pushbutton on Programmer and Monitor panel.
TARGET 2 DATA INSERTION	TARGET 2 DATA INSERTION
151. When VERB 06 NOUN 61 flash, insure that the DSKY displays the following: a. Row 1 displays +13500 b. Row 2 displays +00000 c. Row 3 displays 00002 If displays are correct, proceed to step 152,	151. When VERB 06 NOUN 61 flash, press EXECUTE pushbutton on Programmer and Monitor panel. The DSKY shall display the following: a. Row 1 shall display +13500 b. Row 2 shall display +00000

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
if not, perform following DSKY operations: To correct only Row 1: VERB 21 ENTR +13500 ENTR To correct only Row 2: VERB 22 ENTR +00000 ENTR Row 3 shall display 00002.	c. Row 3 shall display 00002.
152. Enter VERB 33 and press ENTR pushbutton on DSKY.	152. Press EXECUTE pushbutton on Programmer and Monitor panel.
COARSE MARK STAR 1	COARSE MARK STAR 1
153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.	153. Set OPTICS SPEED switch on Indicator Control panel to HI. Set OPTICS COUPLING switch to DIRECT. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.
154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.	154. Set OPTICS SPEED switch on Indicator Control panel to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 155, if not, press MARK REJECT pushbutton and repeat this step.
COARSE MARK STAR 2	COARSE MARK STAR 2
155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's	155. Set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.	indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.
156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.	156. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central vertical reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 157, if not, press MARK REJECT pushbutton and repeat this step.
FINE MARK STAR 1	FINE MARK STAR 1
157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.	157. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 00.0°, respectively.
NOTE: Minimize the time between MARKS taken in steps 158 and 160.	NOTE: Minimize the time between MARKS taken in steps 158 and 160.
158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.	158. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until SXT vertical reticle line is centered on the vertical reticle line and dot of target #1. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 159, if not, press MARK REJECT pushbutton and repeat this step.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
FINE MARK STAR 2	FINE MARK STAR 2
159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.	159. When VERB 51 NOUN 30 flash, set OPTICS COUPLING switch to DIRECT. Set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive the optics until the shaft and trunnion TPAC's indicate 270.0° and 45.0°, respectively. Set OPTICS COUPLING switch to RSLV.
160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.	160. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #3. Press MARK pushbutton. If conditions are satisfactory, press ENTR pushbutton and proceed to step 161, if not, press MARK REJECT pushbutton and repeat this step.
X PIPA ABOUT Z MISALIGNMENT	X PIPA ABOUT Z MISALIGNMENT
161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.	161. In approximately 7 minutes, VERB 06 NOUN 66 shall flash. Record Row 1 and Row 2 indications.
162. Enter VERB 33 and press ENTR pushbutton on DSKY.	162. Press EXECUTE pushbutton on Programmer and Monitor panel.
Z PIPA ABOUT X MISALIGNMENT	Z PIPA ABOUT X MISALIGNMENT
163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.	163. When VERB 06 NOUN 66 flash, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.
TEST TERMINATION	TEST TERMINATION
164. Perform following DSKY operations: a. VERB 34 ENTR b. Observe: PROG display indicates 00.	164. Press EXECUTE pushbutton on Programmer and Monitor panel. The PROG display on the DSKY shall indicate 00.

MANUAL LOAD PROCEDURES

c. VERB 40 NOUN 20 ENTR
Wait 5 seconds
d. VERB 41 NOUN 20 ENTR
e. Observe:
VERB 21 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 22 NOUN 22 Flashing
h. +00000 ENTR
i. Observe:
VERB 23 NOUN 22 Flashing
j. +00000 ENTR

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike cradle locking handles.

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

NOTE: Step 165A applies only when Restart Monitor module (2898989) is installed.

165A. Perform the following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

CTS UPLINK TAPE LOAD PROCEDURES

164A. Press EXECUTE pushbutton on Programmer and Monitor panel. Wait 5 seconds and then press EXECUTE pushbutton again.

164B. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164C. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

164D. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

CAUTION: Use extreme care when tilting G&N Mounting Fixture to insure that components do not strike cradle locking handles.

165. Set G & N Mounting Fixture tilt axis to 32.5°. Take care not to strain or break hoses or cables.

NOTE: Step 165A applies only when Restart Monitor module (2898989) is installed.

165A. Perform the following DSKY operations:
a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

DATE ________

MANUAL LOAD PROCEDURES

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

CTS UPLINK TAPE LOAD PROCEDURES

166. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

167. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+42.902
GAEC	+40.748
MILA	+28.523
MIT	+42.366
MSC	+29.556
NAA	+33.921

168. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press MONITOR pushbutton. MONITOR pushbutton shall light and AGC INPUT-CTR pushbutton shall go out.

171. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

DATE ________

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

172. Press to extinguish SELF TEST pushbutton on Self Test panel.

173. Disconnect Self Test Assembly from Buffer Box Assembly. Connect cable W226 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 5

JDC
NO. 12218
REV U
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ________ CAL DATE
NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
4	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
24	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			a
26	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( ) ____.____	▨			b
30	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12218
REV. U

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
30 (cont)			24000		27242			
			30000		33242			
			34000		37242			
50	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			c
52	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			d
56	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
81	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			e
83	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			f
87	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12218
REV. U

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
112	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____.____	▨			g
114	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			h
122	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
137	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			i
139	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			j
143	Row 1 indication	time bits	00000		03242			
			04000		07242			
			10000		13242			
			14000		17242			
			20000		23242			
			24000		27242			
			30000		33242			
			34000		37242			
161	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____.____	▨			k

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12218
REV. U

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
163	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____.____	▨			l
167	Y PIPA about Z (Bias corrected)	arc sec	▨		▨			m
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			n
	X PIPA about Y (Bias corrected)	arc sec	-150		+150			o
	Y PIPA about X (Bias corrected)	arc sec	▨		▨			p
	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			q
	Z PIPA about Y (Bias corrected)	arc sec	▨		▨			r
	X PIPA about Y (Bias corrected)	arc sec	▨		▨			s
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			t
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			u
	Z PIPA about X (Bias corrected)	arc sec	▨		▨			v
	X PIPA about Z (Bias corrected)	arc sec	▨		▨			w
	Z PIPA about X (Bias corrected)	arc	-150		+150			x

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12218
REV. U

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
167	Enter the latest values form JDC 12217 or JDC 12267

X PIPA Bias ________ cm/sec^2
Y PIPA Bias ________ cm/sec^2
Z PIPA Bias ________ cm/sec^2
θ_X = 210 (X PIPA Bias) = ________ arc sec
θ_Y = 210 (Y PIPA Bias) = ________ arc sec
θ_Z = 210 (Z PIPA Bias) = ________ arc sec
Line a - θ_Y = ________ enter on line m
Line b - θ_Z = ________ enter on line n
Line c - θ_X = ________ enter on line o
Line d - θ_Y = ________ enter on line p
Line e - θ_Y = ________ enter on line q
Line f - θ_Z = ________ enter on line r
Line g - θ_X = ________ enter on line s
Line h - θ_Y = ________ enter on line t
Line i - θ_X = ________ enter on line u
Line j - θ_Z = ________ enter on line v
Line k - θ_X = ________ enter on line w
Line l - θ_Z = ________ enter on line x

DATE ________

JOB G & N FINE ALIGN TEST

JDC 12218 REV. - PAGE 1 OF 7
INITIAL TDRR 29882 D.S. PGS 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This test determines the overall G & N System accuracy to which the Stable Member can be aligned anywhere within a reference coordinate system. The alignment technique is based on the fact that SXT sightings of two stars can be used to orient the Stable Member (Laboratory targets #1 and #4 are used as simulated stars.) The SXT measures star angles with respect to the Nav Base. The orientation of the Stable Member with respect to the Nav Base is obtained from the IMU gimbal angles. The CMC uses this information to align the Stable Member to Southeast, Southwest and Vertical with respect to the laboratory coordinate system. The CMC uses the Southeast and Southwest PIPA outputs as a criteria of alignment. The X and Z Stable Member axis are in turn aligned to local vertical.

INITIALIZATION

1. Establish a Master Initialization condition.

2. Make the following switch settings on the Indicator Control panel:
   a. OPTICS MODE to ZERO
   b. OPTICS SPEED to LO
   c. OPTICS COUPLING TO DIRECT
   d. OPTICS TRACKER to OFF
   e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

TEST ENTRY

3. Perform the following DSKY operations:
   a. VERB 57 ENTR
   b. 00003 ENTR

4. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
   a. Row 1 displays +135.00

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

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b. Row 2 displays +XX.XXX (Test site latitude from Table 1).

If the displays are correct, proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1
   a. VERB 21 ENTR
   b. +13500 ENTR

To change only Row 2
   c. VERB 22 ENTR
   d. SITE LATITUDE ENTR

TEST POSITION 1 ENTRY

6. Perform the following DSKY operations:
   a. VERB 33 ENTR
   b. Observe
      VERB 21 NOUN 30 Flashing
   c. +00001 ENTR
   d. Observe
      VERB 22 NOUN 30 Flashing
   e. +00000 ENTR
   f. Observe
      VERB 23 NOUN 30 Flashing
   g. +00001 ENTR

Y_{NB} AZIMUTH AND ELEVATION

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
   a. Row 1 displays +27000
   b. Row 2 displays +00000
   c. Row 3 displays 00001

8. If the displays are correct, proceed to step 10, if not proceed to step 9.

9. Perform the following DSKY operations:

To change only Row 1
   a. VERB 21 ENTR
   b. +27000 ENTR

To change only Row 2
   c. VERB 22 ENTR
   d. +00000 ENTR

Row 3 shall indicate 00001.

10. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z_{NB} AZIMUTH AND ELEVATION

11. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
   a. Row 1 displays +18000
   b. Row 2 displays +00000
   c. Row 3 displays 00002

If the displays are correct, proceed to step 13, if not proceed to step 12.

12. Perform the following DSKY operations:

To change only Row 1.
   a. VERB 21 ENTR
   b. +18000 ENTR

To change only Row 2
   c. VERB 22 ENTR
   d. +00000 ENTR

Row 3 shall indicate 00002.

13. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 1 DATA INSERTION

14. When VERB 06 and NOUN 61 commence

DATE ______

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flashing, insure that the DSKY displays the following:
   a. Row 1 displays +18000
   b. Row 2 displays +00000
   c. Row 3 displays 00001

If the displays are correct, proceed to step 16, if not proceed to step 15.

15. Perform the following DSKY operations: To correct only Row 1
   a. VERB 21 ENTR
   b. +18000 ENTR

To correct only Row 2
   c. VERB 22 ENTR
   d. +00000 ENTR

Row 3 shall indicate 00001

16. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

TARGET 2 DATA INSERTION

17. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:
   a. Row 1 displays +13500
   b. Row 2 displays +00000
   c. Row 3 displays 00002

If the displays are correct, proceed to step 19, if not proceed to step 18.

18. Perform the following DSKY operations: To correct only Row 1
   a. VERB 21 ENTR
   b. +13500 ENTR

To correct only Row 2
   c. VERB 22 ENTR
   d. +00000 ENTR

Row 3 shall indicate 00002.

19. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

COARSE MARK STAR 1

20. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

21. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 22, if not press the MARK REJECT and repeat this step.

COARSE MARK STAR 2

22. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to target #4

DATE ______

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location. Wait until the optics stop driving before proceeding.

23. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the Optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 24, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

24. The Stable Member will be coarse aligned to the desired test position. In approximately 90 seconds VERB 51 and NOUN 30 shall commence flashing. Set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #1 location. Wait until the optics stop driving before proceeding.

25. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton on the Indicator Control panel. If conditions are satisfactory, press ENTR and proceed to step 26, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

26. When VERB 51 and NOUN 30 commence flashing, set the OPTICS MODE switch on the Indicator Control panel to CMC. The CMC will automatically align the SXT to the target #4 location. Wait until the optics stops driving before proceeding.

27. Set the OPTICS MODE switch to MAN. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton on the Indicator Control panel.

If conditions are satisfactory, press the ENTR pushbutton and proceed to step 28, if not press MARK REJECT and repeat this step.

Y PIPA ABOUT Z MISALIGNMENT

28. In approximately 10 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

29. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT Y MISALIGNMENT

30. When VERB 06 and NOUN 66 commence flashing. Row 1 and Row 2 shall contain the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

31. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

DATE ______

INITIALIZATION POSITION 2

32. Set the OPTICS MODE switch on the Indicator Control panel to ZERO.

33. Perform the following DSKY operations:

a. VERB 57	ENTR
b. 00003	ENTR

34. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 2 ENTRY

35. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe		
VERB 21	NOUN 30	Flashing
c. +00002		ENTR
d. Observe		
VERB 22	NOUN 30	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 30	Flashing
g. +00001		ENTR

36. Repeat steps 7 through 27.

X PIPA ABOUT Y MISALIGNMENT

37. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Y PIPA ABOUT X MISALIGNMENT

39. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

40. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

INITIALIZATION POSITION 3

41. Set the OPTICS MODE switch on the Indicator Control panel to ZERO. Wait 15 seconds then set the OPTICS MODE switch to MAN.

42. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. +00000		ENTR
c. +00000		ENTR
d. +00000		ENTR

43. Set the G & N Mounting Fixture Tilt Axis to 0°. Take care not to strain or break hoses or cables.

44. Using the Optics Hand Controller, drive the SXT shaft to -90° as indicated on the T PAK shaft readout. (Set the CONTROLLER SPEED switch to HI and LO as required.) (0° Trunnion)

45. Adjust the G & N Mounting Fixture Tilt Axis until the SXT control horizontal reticle line is centered on the horizontal reticle line of target #1.

46. Perform the following DSKY operations:

a. VERB 57	ENTR
b. 00003	ENTR

DATE ______

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47. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

a. Row 1 displays +13500
b. Row 2 displays +XX.XXX (Test site latitude from Table 1)

TEST POSITION 3 ENTRY

48. Perform the following DSKY operations:

a. VERB 33		ENTR
b. Observe		
VERB 21	NOUN 30	Flashing
c. +00003		ENTR
d. Observe		
VERB 22	NOUN 30	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 30	Flashing
g. +00000		ENTR

49. Repeat steps 14 through 19.

COARSE MARK STAR 1

50. Set the CONTROLLER SPEED switch set to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the vertical reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 51, if not press MARK REJECT and repeat this step.

COARSE MARK STAR #2

51. Set the OPTICS MODE switch to MANUAL and the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

52. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central verticle reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 53, if not press MARK REJECT and repeat this step.

FINE MARK STAR 1

53. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 00.0° respectively.

54. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 55, if not press MARK REJECT and repeat this step.

FINE MARK STAR 2

55. When VERB 51 and NOUN 30 commence flashing, set the CONTROLLER SPEED switch to HI. Use the Optics Hand Controller to drive the optics

DATE ______

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until the Shaft and Trunnion counters on the T PAC indicate 270.0° and 45.0° respectively.

56. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of Target #4. Press the MARK pushbutton. If conditions are satisfactory, press ENTR and proceed to step 57, if not press MARK REJECT and repeat this step.

X PIPA ABOUT Z MISALIGNMENT

57. In approximately 7 minutes, VERB 06 and NOUN 66 shall commence flashing. Record Row 1 and Row 2 indications.

58. Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Z PIPA ABOUT X MISALIGNMENT

59. When VERB 06 and NOUN 66 commence flashing, Row 1 and Row 2 shall display the second horizontal PIPA misalignment. Record Row 1 and Row 2 indications.

TEST TERMINATION

60. Perform the following DSKY operations:

a. VERB 34 ENTR
b. The PROG display shall indicate 00

c. VERB 41	NOUN 20	ENTR
d. +00000		ENTR
e. +00000		ENTR
f. +00000		ENTR

61. Set the G & N Mounting Fixture Tilt axis to 32.5°. Take care not to strain or break the hoses or cables.

62. Perform the calculations on the calculation sheet and complete the data sheets.

Table 1

Latitude of Test Site	
Location	Latitude
AC	+ 42.300
GAEC	+ 40.748
MILA	+ 28.516
MIT	+ 42.361
MSC	+ 29.556
NAA	+ 33.917

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12218
REV. -
INITIAL TDRR 29882

JOB G & N FINE ALIGN TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28	Y PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			a
30	Z PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			b
37	X PIPA about Y misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			c
39	Y PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			d
57	X PIPA about Z misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			e
56	Z PIPA about X misalignment	arc sec	▨	R1 R2 ( )____ . ____	▨			f
62	Y PIPA about Z (Bias corrected)	arc sec	-150		+150			g
	Z PIPA about Y (Bias corrected)	arc sec	-150		+150			h

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12218
REV. -

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
62 (Cont)	X PIPA about Y (Bias corrected)	arc sec	-150		+150			i
	Y PIPA about X (Bias corrected)	arc sec	-150		+150			j
	X PIPA about Z (Bias corrected)	arc sec	-150		+150			k
	Z PIPA about X	arc sec	-150		+150			l
2 thru 62	Displays reacted as indicated							

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12218
REV. -

JOB G & N FINE ALIGN TEST

JDC ITEM NO.	CALCULATIONS
62	Enter the latest values from JDC 12217 X PIPA Bias ________ cm/sec^2 Y PIPA Bias ________ cm/sec^2 Z PIPA Bias ________ cm/sec^2 θ_X = 210 (X PIPA Bias) = ________ arc sec θ_Y = 210 (Y PIPA Bias) = ________ arc sec θ_Z = 210 (Z PIPA Bias) = ________ arc sec Line a - θ_Y = ________ enter on line g Line b - θ_Z = ________ enter on line h Line c - θ_X = ________ enter on line i Line d - θ_Y = ________ enter on line j Line e - θ_X = ________ enter on line k Line f - θ_Z = ________ enter on line l

DATE ________

JDC 12219 REV. A PAGE 1 OF 3
JOB IRIG SCALE FACTOR TEST
INITIAL TDRR 29882 D.S. PGS 3
SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION The average plus and minus torquing scale factor error of each IRIG is determined in this JDC. The input axis of the tested IRIG is positioned east (or west) to minimize earth rate effects. A CGC program provides torquing to the IRIG under Test. Each IRIG is torqued ±22.5° by monitoring the CDU of the gimbal placed parallel to the test IRIG's input (cont below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31898	1	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont)
axis for 2048 counts. The number of CGC torquing pulses required to torque the test IRIG 22.5 is determined and IRIG scale factor is calculated.

INITIALIZATION

1. Insure that the G & N Cradle Assembly is set to 32.5° and the system is in a Master Initialization Condition.

2. Insure that the G & N system has been in ISS OPERATE for a minimum of one hour before proceeding. Record the GYRO WHEEL time on the data sheet.

3. Enter VERB 57 and press the ENTR pushbutton on the DSKY. Enter 5 and press the ENTR pushbutton. The PROG display shall indicate 07.

4. When VERB 06 and NOUN 61 flash, insure that Row 1 on the DSKY indicates the navigation base azimuth of +18000 and that Row 2 indicates the latitude of the site where this test is being performed (See Table 1). If Row 1 and Row 2 indications are correct, enter VERB 33 and press the ENTR pushbutton on the DSKY, then proceed to step 6. If Row 1 and/or Row 2 indications are incorrect, proceed to step 5.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB IRIG SCALE FACTOR TEST
JDC 12219 REV A PAGE 2 OF 3
SUBSYSTEM G & N SYSTEM
ASSY

5. Perform the following DSKY operations:

To change Row 1 -
VERB 21 ENTR
+18000 ENTR
To change Row 2 -
VERB 22 ENTR
Test site latitude from Table 1 ENTR

Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Test Site	Latitude
MIT	+42.366
AC	+42.900
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 1

NOTE: If the PROG lamp on the DSKY changes from 07 to 00 at any time during the performance of steps 6 through 11, record indications and values for Rows 1, 2 and 3 of DSKY in System Log. Enter VERB 36 and press the ENTR pushbutton. Repeat steps 3 through 5 then return to the step in which the failure occurred and continue with the procedure.

-X IRIG SCALE FACTOR

6. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00001 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-Y IRIG SCALE FACTOR

7. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00002 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+Z IRIG SCALE FACTOR

8. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00003 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed on Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

JOB IRIG SCALE FACTOR TEST
JDC 12219 REV A PAGE 3 OF 3
SUBSYSTEM G & N SYSTEM
ASSY

+X IRIG SCALE FACTOR

9. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00001 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed on Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+Y IRIG SCALE FACTOR

10. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00002 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-Z IRIG SCALE FACTOR

11. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00003 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

12. Repeat steps 6 through 11 twice.

13. Enter VERB 34 and press the ENTR pushbutton to terminate test.

14. Perform the calculations listed on the data sheet.

15. Upon completion of the data sheet, make a copy of the data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12219
REV. A
INITIAL TDRR 29882

JOB IRIG SCALE FACTOR TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2	GYRO WHEEL	Hours					
6	-X IRIG scale factor error Position +00001	PPM					
7	-Y IRIG scale factor error Position +00002	PPM					
8	+Z IRIG scale factor error Position +00003	PPM					
9	+X IRIG scale factor error Position -00001	PPM					
10	+Y IRIG scale factor error Position -00002	PPM					
11	-Z IRIG scale factor error Position -00003	PPM					

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 3

JDC
NO. 12219
REV. A

JOB IRIG SCALE FACTOR TEST

	CALCULATIONS
14	Perform the following calculations for average values of $-X_{SF}$, $+X_{SF}$, $-Y_{SF}$, $+Y_{SF}$, $-Z_{SF}$, and $+Z_{SF}$ error. Transfer all results of data sheet items 14a through 14f. $-X_{SF}$ av Position +00001 = $\frac{X_1 + X_2 + X_3}{3}$ = ______
	$+X_{SF}$ av Position -00001 = $\frac{X_1 + X_2 + X_3}{3}$ = ______
	$-Y_{SF}$ av Position +00002 = $\frac{Y_1 + Y_2 + Y_3}{3}$ = ______
	$+Y_{SF}$ av Position -00002 = $\frac{Y_1 + Y_2 + Y_3}{3}$ = ______
	$+Z_{SF}$ av Position +00003 = $\frac{Z_1 + Z_2 + Z_3}{3}$ = ______
	$-Z_{SF}$ av Position -00003 = $\frac{Z_1 + Z_2 + Z_3}{3}$ = ______

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 3

JDC
NO. 12219
REV. A

JOB IRIG SCALE FACTOR TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
14	Average -X IRIG scale factor error	PPM	-1750		+1750		
	Average +X IRIG scale factor error	PPM	-1750		+1750		
	Average -Y IRIG scale factor error	PPM	-1750		+1750		
	Average +Y IRIG scale factor error	PPM	-1750		+1750		
	Average +Z IRIG scale factor error	PPM	-1750		+1750		
	Average -Z IRIG scale factor error	PPM	-1750		+1750		

DATE 30 JUN 66

JOB IRIG SCALE FACTOR TEST | JDC 12219 REV. B PAGE 1 OF 3
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION The average plus and minus torquing scale factor error of each IRIG is determined in this JDC. The input axis of the tested IRIG is positioned east (or west) to minimize earth rate effects. A CGC program provides torquing to the IRIG under Test. Each IRIG is torqued ±22.5° by monitoring the CDU of the gimbal placed parallel to the test IRIG's input (cont below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31898	1	-	EA	-
B	11-15-66	31944	1, 2	2	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont)
axis for 2048 counts. The number of CGC torquing pulses required to torque the test IRIG 22.5 is determined and IRIG scale factor is calculated.

INITIALIZATION

1. Insure that the G & N Cradle Assembly is set to 32.5° and the system is in a Master Initialization Condition (JDC 12215).

2. Insure that the G & N system has been in ISS OPERATE for a minimum of one hour before proceeding. Record the GYRO WHEEL time on the data sheet.

3. Enter VERB 57 and press the ENTR pushbutton on the DSKY. Enter 5 and press the ENTR pushbutton. The PROG display shall indicate 07.

4. When VERB 06 and NOUN 61 flash, insure that Row 1 on the DSKY indicates the navigation base azimuth of +18000 and that Row 2 indicates the latitude of the site where this test is being performed (See Table 1). If Row 1 and Row 2 indications are correct, enter VERB 33 and press the ENTR pushbutton on the DSKY, then proceed to step 6. If Row 1 and/or Row 2 indications are incorrect, proceed to step 5.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB IRIG SCALE FACTOR TEST | JDC 12219 REV B PAGE 2 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

5. Perform the following DSKY operations:

To change Row 1 -
VERB 21 ENTR
+18000 ENTR
To change Row 2 -
VERB 22 ENTR
Test site latitude from Table 1 ENTR

Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 1

NOTE: If the PROG lamp on the DSKY changes from 07 to 00 at any time during the performance of steps 6 through 11, record indications and values for Rows 1, 2 and 3 of DSKY in System Log. Enter VERB 36 and press the ENTR pushbutton. Repeat steps 3 through 5 then return to the step in which the failure occurred and continue with the procedure.

-X IRIG SCALE FACTOR

6. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00001 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-Y IRIG SCALE FACTOR

7. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00002 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+Z IRIG SCALE FACTOR

8. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00003 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed on Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

JOB IRIG SCALE FACTOR TEST | JDC 12219 REV B PAGE 3 OF 3

SUBSYSTEM G & N SYSTEM | ASSY

+X IRIG SCALE FACTOR

9. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00001 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed on Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+Y IRIG SCALE FACTOR

10. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00002 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-Z IRIG SCALE FACTOR

11. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00003 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

12. Repeat steps 6 through 11 twice.

13. Enter VERB 34 and press the ENTR pushbutton to terminate test.

14. Perform the calculations listed on the data sheet.

15. Upon completion of the data sheet, make a copy of the data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12219 JDC
REV. B
INITIAL TDRR 29882

JOB IRIG SCALE FACTOR TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2	GYRO WHEEL	Hours	▨		▨	▨	▨
6	-X IRIG scale factor error Position +00001	PPM	▨		▨	▨	▨
7	-Y IRIG scale factor error Position +00002	PPM	▨		▨	▨	▨
8	+Z IRIG scale factor error Position +00003	PPM	▨		▨	▨	▨
9	+X IRIG scale factor error Position -00001	PPM	▨		▨	▨	▨
10	+Y IRIG scale factor error Position -00002	PPM	▨		▨	▨	▨
11	-Z IRIG scale factor error Position -00003	PPM	▨		▨	▨	▨

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12219
REV. B

JOB IRIG SCALE FACTOR TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ	ACC
12 (6)	-X IRIG scale factor error Position +00001	PPM	▨		▨	▨	▨
12 (7)	-Y IRIG scale factor error Position +00002	PPM	▨		▨	▨	▨
12 (8)	+Z IRIG scale factor error Position +00003	PPM	▨		▨	▨	▨
12 (9)	+X IRIG scale factor error Position -00001	PPM	▨		▨	▨	▨
12 (10)	+Y IRIG scale factor error Position -00002	PPM	▨		▨	▨	▨
12 (11)	-Z IRIG scale factor error Position -00003	PPM	▨		▨	▨	▨

* TO BE USED AS REQUIRED OR DESIRED

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12219
REV. B

JOB IRIG SCALE FACTOR TEST

	CALCULATIONS
14	Perform the following calculations for average values of $-X_{SF}$, $+X_{SF}$, $-Y_{SF}$, $+Y_{SF}$, $-Z_{SF}$, and $+Z_{SF}$ error. Transfer all results of data sheet items 14a through 14f. $-X_{SF}$ av Position +00001 $= \frac{X_1 + X_2 + X_3}{3} =$ __________
	$+X_{SF}$ av Position -00001 $= \frac{X_1 + X_2 + X_3}{3} =$ __________
	$-Y_{SF}$ av Position +00002 $= \frac{Y_1 + Y_2 + Y_3}{3} =$ __________
	$+Y_{SF}$ av Position -00002 $= \frac{Y_1 + Y_2 + Y_3}{3} =$ __________
	$+Z_{SF}$ av Position +00003 $= \frac{Z_1 + Z_2 + Z_3}{3} =$ __________
	$-Z_{SF}$ av Position -00003 $= \frac{Z_1 + Z_2 + Z_3}{3} =$ __________

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12219
REV. B

JOB IRIG SCALE FACTOR TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
14	Average -X IRIG scale factor error	PPM	-1750		+1750		
	Average +X IRIG scale factor error	PPM	-1750		+1750		
	Average -Y IRIG scale factor error	PPM	-1750		+1750		
	Average +Y IRIG scale factor error	PPM	-1750		+1750		
	Average +Z IRIG scale factor error	PPM	-1750		+1750		
	Average -Z IRIG scale factor error	PPM	-1750		+1750		

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JOB IRIG SCALE FACTOR TEST

JDC 12219 **REV.** C **PAGE** 1 **OF** 3
INITIAL TDRR 29882 **D.S. PGS.** 3

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION The average plus and minus torquing scale factor error of each IRIG is determined in this JDC. The input axis of the tested IRIG is positioned east (or west) to minimize earth rate effects. A CGC program provides torquing to the IRIG under Test. Each IRIG is torqued ±22.5° by monitoring the CDU of the gimbal placed parallel to the test IRIG's input (cont below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31898	1	-	EA	-
B	11-15-66	31944	1, 2	2	EA	-
C	9-14-67	34611	2, 3	All	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont)
axis for 2048 counts. The number of CGC torquing pulses required to torque the test IRIG 22.5 is determined and IRIG scale factor is calculated.

INITIALIZATION

1. Insure that the G & N Cradle Assembly is set to 32.5° and the system is in a Master Initialization Condition (JDC 12215).

2. Insure that the G & N system has been in ISS OPERATE for a minimum of one hour before proceeding. Record the GYRO WHEEL time on the data sheet.

3. Enter VERB 57 and press the ENTR pushbutton on the DSKY. Enter 5 and press the ENTR pushbutton. The PROG display shall indicate 07.

4. When VERB 06 and NOUN 61 flash, insure that Row 1 on the DSKY indicates the navigation base azimuth of +18000 and that Row 2 indicates the latitude of the site where this test is being performed (See Table 1). If Row 1 and Row 2 indications are correct, enter VERB 33 and press the ENTR pushbutton on the DSKY, then proceed to step 6. If Row 1 and/or Row 2 indications are incorrect, proceed to step 5.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB IRIG SCALE FACTOR TEST
JDC 12219 **REV** C **PAGE** 2 **OF** 3

SUBSYSTEM G & N SYSTEM
ASSY

5. Perform the following DSKY operations:

To change Row 1 -
VERB 21 ENTR
+18000 ENTR
To change Row 2 -
VERB 22 ENTR
Test site latitude ENTR
from Table 1

Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 1

NOTE: If the PROG lamp on the DSKY changes from 07 to 00 at any time during the performance of steps 6 through 11, record indications and values for Rows 1, 2 and 3 of DSKY in System Log. Enter VERB 36 and press the ENTR pushbutton. Repeat steps 3 through 5 then return to the step in which the failure occurred and continue with the procedure.

+X IRIG SCALE FACTOR

6. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00001 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+Y IRIG SCALE FACTOR

7. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00002 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+Z IRIG SCALE FACTOR

8. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00003 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed on Row 1 of the

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JOB IRIG SCALE FACTOR TEST
JDC 12219 **REV** C **PAGE** 3 **OF** 3

SUBSYSTEM G & N SYSTEM
ASSY

DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-X IRIG SCALE FACTOR

9. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00001 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed on Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-Y IRIG SCALE FACTOR

10. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00002 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-Z IRIG SCALE FACTOR

11. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00003 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

12. Repeat steps 6 through 11 twice.

13. Enter VERB 34 and press the ENTR pushbutton to terminate test.

14. Perform the calculations listed on the data sheet.

15. Upon completion of the data sheet, make a copy of the data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 3

NO. 12219 JDC
REV. C
INITIAL TDRR 29882

JOB IRIG SCALE FACTOR TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd	3rd			
2	GYRO WHEEL	Hours	▨				▨	▨	▨
6	+X IRIG scale factor error Position +00001	PPM	▨				▨	▨	▨
7	+Y IRIG scale factor error Position +00002	PPM	▨				▨	▨	▨
8	+Z IRIG scale factor error Position -00003	PPM	▨				▨	▨	▨
9	-X IRIG scale factor error Position -00001	PPM	▨				▨	▨	▨
10	-Y IRIG scale factor error Position -00002	PPM	▨				▨	▨	▨
11	-Z IRIG scale factor error Position +00003	PPM	▨				▨	▨	▨

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12219
REV. C

JOB IRIG SCALE FACTOR TEST

	CALCULATIONS
14	Perform the following calculations for average values of $+X_{SF}$, $+Y_{SF}$, $+Z_{SF}$, $-X_{SF}$, $-Y_{SF}$, and $-Z_{SF}$ error. Transfer all results to data sheet items 14.a through 14.f. $+X_{SF}$ av Position +00001 = $\frac{X_1 + X_2 + X_3}{3}$ = ________
	$+Y_{SF}$ av Position -00002 = $\frac{Y_1 + Y_2 + Y_3}{3}$ = ________
	$+Z_{SF}$ av Position +00003 = $\frac{Z_1 + Z_2 + Z_3}{3}$ = ________
	$-X_{SF}$ av Position -00001 = $\frac{X_1 + X_2 + X_3}{3}$ = ________
	$-Y_{SF}$ av Position +00002 = $\frac{Y_1 + Y_2 + Y_3}{3}$ = ________
	$-Z_{SF}$ av Position -00003 = $\frac{Z_1 + Z_2 + Z_3}{3}$ = ________

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12219
REV. C

JOB IRIG SCALE FACTOR TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
14.a	Average +X IRIG scale factor error	PPM	-1750		+1750		
14.b	Average +Y IRIG scale factor error	PPM	-1750		+1750		
14.c	Average +Z IRIG scale factor error	PPM	-1750		+1750		
14.d	Average -X IRIG scale factor error	PPM	-1750		+1750		
14.e	Average -Y IRIG scale factor error	PPM	-1750		+1750		
14.f	Average -Z IRIG scale factor error	PPM	-1750		+1750		

DATE 30 JUN 66

JOB IRIG SCALE FACTOR TEST

JDC 12219 **REV.** D **PAGE** 1 **OF** 3
INITIAL TDRR 29882 **D.S. PGS** 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The average plus and minus torquing scale factor error of each IRIG is determined in this JDC. The input axis of the tested IRIG is positioned east (or west) to minimize earth rate effects. A CGC program provides torquing to the IRIG under Test. Each IRIG is torqued ±22.5° by monitoring the CDU of the gimbal placed parallel to the test IRIG's input (cont below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	11-10-66	31898	1	-	EA	-
B	11-15-66	31944	1,2	2	EA	-
C	9-14-67	34611	2,3	All	EA	-
D	1-11-68	35385	1	2	EA	-

REFERENCES PS-2.15000

IMPORTANT Insure that connector assembly (2003099) is connected to the CGC test connector.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont)
axis for 2048 counts. The number of CGC torquing pulses required to torque the test IRIG 22.5 is determined and IRIG scale factor is calculated.

INITIALIZATION

1. Insure that the G & N Cradle Assembly is set to 32.5° and the system is in a Master Initialization Condition (JDC 12215).

2. Insure that the G & N system has been in ISS OPERATE for a minimum of one hour before proceeding. Record the GYRO WHEEL time on the data sheet.

3. Enter VERB 57 and press the ENTR pushbutton on the DSKY. Enter 5 and press the ENTR pushbutton. The PROG display shall indicate 07.

4. When VERB 06 and NOUN 61 flash, insure that Row 1 on the DSKY indicates the navigation base azimuth of +18000 and that Row 2 indicates the latitude of the site where this test is being performed (See Table 1). If Row 1 and Row 2 indications are correct, enter VERB 33 and press the ENTR pushbutton on the DSKY, then proceed to step 6. If Row 1 and/or Row 2 indications are incorrect, proceed to step 5.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB IRIG SCALE FACTOR TEST **JDC** 12219 **REV** D **PAGE** 2 **OF** 3

SUBSYSTEM G & N SYSTEM **ASSY**

5. Perform the following DSKY operations:

To change Row 1 -	
VERB 21	ENTR
+18000	ENTR
To change Row 2 -	
VERB 22	ENTR
Test site latitude from Table 1	ENTR

Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 1

NOTE: If the PROG lamp on the DSKY changes from 07 to 00 at any time during the performance of steps 6 through 11, record indications and values for Rows 1, 2 and 3 of DSKY in System Log. Enter VERB 36 and press the ENTR pushbutton. Repeat steps 3 through 5 then return to the step in which the failure occurred and continue with the procedure.

+X IRIG SCALE FACTOR

6. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00001 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+Y IRIG SCALE FACTOR

7. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00002 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+Z IRIG SCALE FACTOR

8. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00003 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed on Row 1 of the

DATE 30 JUN 66

JOB IRIG SCALE FACTOR TEST **JDC** 12219 **REV** D **PAGE** 3 **OF** 3

SUBSYSTEM G & N SYSTEM **ASSY**

DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-X IRIG SCALE FACTOR

9. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00001 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed on Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-Y IRIG SCALE FACTOR

10. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00002 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-Z IRIG SCALE FACTOR

11. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00003 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

12. Repeat steps 6 through 11 twice.

13. Enter VERB 34 and press the ENTR pushbutton to terminate test.

14. Perform the calculations listed on the data sheet.

15. Upon completion of the data sheet, make a copy of the data sheet and forward immediately to:

Inertial Subsystem Development
Div. 963
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 3

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REV. D
INITIAL TDRR 29882

JOB IRIG SCALE FACTOR TEST

ASSEMBLY UNDER TEST

TITLE ____________________
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________________ SER. NO. ______ CAL DATE
NAME ____________________ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE			MAX VALUE	REJ	ACC
				1st	2nd	3rd			
2	GYRO WHEEL	Hours	▨				▨	▨	▨
6	+X IRIG scale factor error Position +00001	PPM	▨				▨	▨	▨
7	+Y IRIG scale factor error Position +00002	PPM	▨				▨	▨	▨
8	+Z IRIG scale factor error Position -00003	PPM	▨				▨	▨	▨
9	-X IRIG scale factor error Position -00001	PPM	▨				▨	▨	▨
10	-Y IRIG scale factor error Position -00002	PPM	▨				▨	▨	▨
11	-Z IRIG scale factor error Position +00003	PPM	▨				▨	▨	▨

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12219
REV. D

JOB IRIG SCALE FACTOR TEST

	CALCULATIONS
14	Perform the following calculations for average values of $+X_{SF}$, $+Y_{SF}$, $+Z_{SF}$, $-X_{SF}$, $-Y_{SF}$, and $-Z_{SF}$ error. Transfer all results to data sheet items 14.a through 14.f. $+X_{SF}$ av Position +00001 $= \frac{X_1 + X_2 + X_3}{3} =$ ______
	$+Y_{SF}$ av Position +00002 $= \frac{Y_1 + Y_2 + Y_3}{3} =$ ______
	$+Z_{SF}$ av Position -00003 $= \frac{Z_1 + Z_2 + Z_3}{3} =$ ______
	$-X_{SF}$ av Position -00001 $= \frac{X_1 + X_2 + X_3}{3} =$ ______
	$-Y_{SF}$ av Position -00002 $= \frac{Y_1 + Y_2 + Y_3}{3} =$ ______
	$-Z_{SF}$ av Position +00003 $= \frac{Z_1 + Z_2 + Z_3}{3} =$ ______

DATE 30 JUN 66

FORM 00148
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12219
REV. D

JOB IRIG SCALE FACTOR TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
14.a	Average +X IRIG scale factor error	PPM	-1750		+1750		
14.b	Average +Y IRIG scale factor error	PPM	-1750		+1750		
14.c	Average +Z IRIG scale factor error	PPM	-1750		+1750		
14.d	Average -X IRIG scale factor error	PPM	-1750		+1750		
14.e	Average -Y IRIG scale factor error	PPM	-1750		+1750		
14.f	Average -Z IRIG scale factor error	PPM	-1750		+1750		

DATE 30 JUN 66

FORM 00147
Chg. 7-23-65

JOB IRIG SCALE FACTOR TEST

JDC 12219 **REV.** - **PAGE** 1 **OF** 3
INITIAL TDRR 29882 **D.S. PGS** 3

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION The average plus and minus torquing scale factor error of each IRIG is determined in this JDC. The input axis of the tested IRIG is positioned east (or west) to minimize earth rate effects. A CGC program provides torquing to the IRIG under Test. Each IRIG is torqued ±22.5° by monitoring the CDU of the gimbal placed parallel to the test IRIG s input (cont below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont)
axis for 2048 counts. The number of CGC torquing pulses required to torque the test IRIG 22.5 is determined and IRIG scale factor is calculated.

INITIALIZATION

1. Insure that the G & N Cradle Assembly is set to 32.5° and the system is in a Master Initialization Condition.

2. Insure that the G & N system has been in ISS OPERATE for a minimum of one hour before proceeding. Record the GYRO WHEEL time on the data sheet.

3. Enter VERB 57 and press the ENTR pushbutton on the NAV DSKY. Enter 5 and press the ENTR pushbutton. The PROG display shall indicate 07.

4. When VERB 06 and NOUN 61 flash, insure that Row 1 on the DSKY indicates the navigation base azimuth of +18000 and that Row 2 indicates the latitude of the site where this test is being performed (See Table 1). If Row 1 and Row 2 indications are correct, enter VERB 33 and press the ENTR pushbutton on the DSKY, then proceed to step 6. If Row 1 and/or Row 2 indications are incorrect, proceed to step 5.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB IRIG SCALE FACTOR TEST

JDC 12219 **REV** - **PAGE** 2 **OF** 3

SUBSYSTEM G & N SYSTEM

ASSY

5. Perform the following DSKY operations:

To change Row 1 -
VERB 21 ENTR
+18000 ENTR
To change Row 2 -
VERB 22 ENTR
Test site latitude ENTR
from Table 1

Enter VERB 33 and press the ENTR pushbutton on the DSKY.

Test Site	Latitude
MIT	+42.366
AC	+42.900
GAEC	+40.748
MSC	+29.556
MILA	+28.516
NAA	+33.921

Table 1

NOTE: If the PROG lamp on the DSKY changes from 07 to 00 at any time during the performance of steps 6 through 11, record indications and values for Rows 1, 2 and 3 of DSKY in System Log. Enter VERB 36 and press the ENTR pushbutton. Repeat steps 3 through 5 then return to the step in which the failure occurred and continue with the procedure.

-X IRIG SCALE FACTOR

6. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00001 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-Y IRIG SCALE FACTOR

7. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00002 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+Z IRIG SCALE FACTOR

8. When VERB 21 and NOUN 30 flash, enter IRIG test position of +00003 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed on Row 1 of the

DATE ________

JOB IRIG SCALE FACTOR TEST

JDC 12219 **REV** - **PAGE** 3 **OF** 3

SUBSYSTEM G & N SYSTEM

ASSY

DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+X IRIG SCALE FACTOR

9. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00001 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed on Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

+Y IRIG SCALE FACTOR

10. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00002 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

-Z IRIG SCALE FACTOR

11. When VERB 21 and NOUN 30 flash, enter IRIG test position of -00003 and press the ENTR pushbutton. In approximately 160 seconds VERB 06 and NOUN 66 shall flash and the IRIG scale factor error in parts per million will be displayed in Row 1 of the DSKY. Record Row 1 indication. Enter VERB 33 and press the ENTR pushbutton.

12. Repeat steps 6 through 11 twice.

13. Enter VERB 34 and press the ENTR pushbutton to terminate test.

14. Perform the calculations listed on the data sheet.

15. Upon completion of the data sheet, make a copy of the data sheet and forward immediately to:

Inertial Subsystem Development
Div. #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042.

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 3

NO. 12219 **JDC**
REV. -
INITIAL TDRR 29882

JOB IRIG SCALE FACTOR TEST

ASSEMBLY UNDER TEST

TITLE ________
SER. NO. ________ DWG ________ REV. ________

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION ________
TIME ________ START ________ END ________ TOTAL ELAPSED ________

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE ________
NAME ________ SER. NO. ________ CAL DATE ________

CONDUCTED BY ________ NAME/AFFILIATION
APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2	GYRO WHEEL	Hours	▨		▨	▨	▨
6	-X IRIG scale factor error Position +00001	PPM	▨		▨	▨	▨
7	-Y IRIG scale factor error Position +00002	PPM	▨		▨	▨	▨
8	+Z IRIG scale factor error Position +00003	PPM	▨		▨	▨	▨
9	+X IRIG scale factor error Position -00001	PPM	▨		▨	▨	▨
10	+Y IRIG scale factor error Position -00002	PPM	▨		▨	▨	▨
11	-Z IRIG scale factor error Position -00003	PPM	▨		▨	▨	▨

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12219
REV. -

JOB IRIG SCALE FACTOR TEST

	CALCULATIONS
14	Perform the following calculations for average values of $-X_{SF}$, $+X_{SF}$, $-Y_{SF}$, $+Y_{SF}$, $-Z_{SF}$, and $+Z_{SF}$ error. Transfer all results of data sheet items 14a through 14f. $-X_{SF}$ av Position +00001 = $\frac{X_1 + X_2 + X_3}{3}$ = ____
	$+X_{SF}$ av Position -00001 = $\frac{X_1 + X_2 + X_3}{3}$ = ____
	$-Y_{SF}$ av Position +00002 = $\frac{Y_1 + Y_2 + Y_3}{3}$ = ____
	$+Y_{SF}$ av Position -00002 = $\frac{Y_1 + Y_2 + Y_3}{3}$ = ____
	$+Z_{SF}$ av Position +00003 = $\frac{Z_1 + Z_2 + Z_3}{3}$ = ____
	$-Z_{SF}$ av Position -00003 = $\frac{Z_1 + Z_2 + Z_3}{3}$ = ____

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12219
REV. -

JOB IRIG SCALE FACTOR TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
14	Average -X IRIG scale factor error	PPM	-1750		+1750		
	Average +X IRIG scale factor error	PPM	-1750		+1750		
	Average -Y IRIG scale factor error	PPM	-1750		+1750		
	Average +Y IRIG scale factor error	PPM	-1750		+1750		
	Average +Z IRIG scale factor error	PPM	-1750		+1750		
	Average -Z IRIG scale factor error	PPM	-1750		+1750		

DATE ____

JOB GIMBAL RESPONSE TEST | JDC 12220 REV. A PAGE 1 OF 9
INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored (continued below).

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			JDC	D.S.	MIT	NASA
A	1-12-67	32623	2	1	EA	-

REFERENCES PS-2018000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont)
on the Oscillograph. After the gimbal friction test, the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

IMPORTANT: 1. All starred (**) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.

2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.

INITIALIZATION

1. Establish a MASTER INITIALIZATION condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector to panel to 220.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

FORM 00143A
Chg. 3-18-66

JOB GIMBAL RESPONSE TEST | JDC 12220 REV A PAGE 2 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR
k.	VERB 40	NOUN 20	ENTR

STATIC LOOP PARAMETERS

5. Set the Primary Signal Selector panel to monitor the following signals on PAVM. Record the in-phase voltage for each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG error Signal	134
c. IG Error Signal	135

6. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total voltage value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

7. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00405		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
l.	37776		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	37777		ENTR

8. Place jumpers between the following points:

GSE	From	To
A1P	DIRECT PROBES OUTPUT	CH4DC
A1P	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45 (hi) 49(lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18(lo)

9. Set CHANNEL 3 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

10. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

DATE 30 JUN 66

JOB GIMBAL RESPONSE TEST | JDC 12220 REV A PAGE 3 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

11. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM
b. CHANNEL 4 to 50 MV/MM
c. CHANNEL 5 to 10 MV/MM

12. Connect P2 of W65 to J15 on TPA #2 and set the IRIG SCALE FACTOR switch on the TPA #2 to 1.

13. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

14. Perform the following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and measure and record the GYRO PVR output on the Current Source Monitor panel per JDC 18016.

15. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

16. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00405		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
l.	40001		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	40000		ENTR

17. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM
b. CHANNEL 4 to 50 MV/MM
c. CHANNEL 5 to 10 MV/MM

18. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

19. Perform the following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

DATE 30 JUN 66

JOB GIMBAL RESPONSE TEST | JDC 12220 REV A PAGE 4 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

20. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

21. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00407		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
m.	37776		ENTR
n.	Observe VERB 22	NOUN 01	Flashing
o.	37777		ENTR

22. Remove the jumper from TB1-45 of TPA #2 and place it on TB2-31 of TPA #2.

23. Remove the jumper from TB2-35 of TPA #2 and place it on TB2-47 of TPA #2.

24. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

25. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

26. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

27. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

28. Perform the following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

DATE 30 JUN 66

JOB GIMBAL RESPONSE TEST

JDC 12220 **REV.** A **PAGE** 1 **OF** 9

INITIAL TDRR 29882 **D.S PGS** 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored (continued below).

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	1-12-67	32623	2	1	EA	-

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont)
on the Oscillograph. After the gimbal friction test, the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

IMPORTANT: 1. All starred (**) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.

2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.

INITIALIZATION

1. Establish a MASTER INITIALIZATION condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector to panel to 220.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR
k. VERB 40 NOUN 20 ENTR

STATIC LOOP PARAMETERS

5. Set the Primary Signal Selector panel to monitor the following signals on PAVM. Record the in-phase voltage for each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG error Signal	134
c. IG Error Signal	135

6. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total voltage value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

7. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 37776 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 37777 ENTR

8. Place jumpers between the following points:

GSE	From	To
A1P	DIRECT PROBES OUTPUT	CH4DC
A1P	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45 (hi) 49(lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18(lo)

9. Set CHANNEL 3 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

10. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

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11. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM
b. CHANNEL 4 to 50 MV/MM
c. CHANNEL 5 to 10 MV/MM

12. Connect P2 of W65 to J15 on TPA #2 and set the IRIG SCALE FACTOR switch on the TPA #2 to 1.

13. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

14. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and measure and record the GYRO PVR output on the Current Source Monitor panel per JDC 18016.

15. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

17. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM
b. CHANNEL 4 to 50 MV/MM
c. CHANNEL 5 to 10 MV/MM

18. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

19. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

20. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

21. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR
k. Observe VERB 21 NOUN 01 Flashing
m. 37776 ENTR
n. Observe VERB 22 NOUN 01 Flashing
o. 37777 ENTR

22. Remove the jumper from TB1-45 of TPA #2 and place it on TB2-31 of TPA #2.

23. Remove the jumper from TB2-35 of TPA #2 and place it on TB2-47 of TPA #2.

24. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

25. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

26. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

27. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

28. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

29. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

30. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. Observe VERB 21	NOUN 01	Flashing
l. 40001		ENTR
m. Observe VERB 22	NOUN 01	Flashing
n. 40000		ENTR

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

32. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

33. Perform the following DSKY operations:

a. VERB 42	ENTR
b. VERB 33	ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

34. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

-MG FRICTION TEST

35. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing

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g. +06750		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00411		ENTR
k. Observe VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. Observe VERB 22	NOUN 01	Flashing
n. 00000		ENTR

36. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

37. Remove the jumper from TB2-31 of TPA #2 and place it on TB2-32 of TPA #2.

38. Remove the jumper from TB2-47 of TPA #2 and place it on TB2-41 of TPA #2.

39. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5

40. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

41. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

42. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

43. Perform the following DSKY operations:

a. VERB 42	ENTR
b. VERB 33	ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

44. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

45. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00411		ENTR

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k. Observe VERB 21	NOUN 01	Flashing
l. 63777		ENTR
m. Observe VERB 22	NOUN 01	Flashing
n. 40000		ENTR

46. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

47. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

48. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

49. Perform the following DSKY operations:

a. VERB 42	ENTR
b. VERB 33	ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

50. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

51. Remove all jumper cables placed during this procedure.

52. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed

IG STEP RESPONSE

53. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

54. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lighted.

55. Press the CHART SPEEDS 100 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

a. CHANNEL 1 to 50 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 10 MV/MM

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56. Set the PHASE SHIFT SELECTOR on the phase sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200~ 0 deg.

57. Connect a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

58. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. Wait 60 seconds		
j. VERB 36		ENTR

59. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

60. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

61. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

62. Record the IG stabilization loop response time on CHANNEL 1 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

MG STEP RESPONSE

63. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 50 MV/MM
c. CHANNEL 3 to 10 MV/MM

64. Remove the jumper of step 57 and connect between TB5-18 of TPA #2 and TB2-10 of TPA #2.

65. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. Wait 60 seconds		
j. VERB 36		ENTR

66. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

67. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

68. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

29. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

30. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00407		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
l.	40001		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	40000		ENTR

31. Set the sensitivities on the Oscillograph Amplifier as follows:
a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

32. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

33. Perform the following DSKY operations:

a.	VERB 42		ENTR
b.	VERB 33		ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

34. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

-MG FRICTION TEST

35. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing

g.	+06750		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00411		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
l.	14000		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	00000		ENTR

36. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

37. Remove the jumper from TB2-31 of TPA #2 and place it on TB2-32 of TPA #2.

38. Remove the jumper from TB2-47 of TPA #2 and place it on TB2-41 of TPA #2.

39. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:
a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5

40. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

41. Set the sensitivities on the Oscillograph Amplifiers as follows:
a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

42. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

43. Perform the following DSKY operations:

a.	VERB 42		ENTR
b.	VERB 33		ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

44. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

45. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	-06750		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00411		ENTR

k.	Observe VERB 21	NOUN 01	Flashing
l.	63777		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	40000		ENTR

46. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

47. Set the sensitivities on the Oscillograph Amplifier as follows:
a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

48. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

49. Perform the following DSKY operations:

a.	VERB 42		ENTR
b.	VERB 33		ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

50. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

51. Remove all jumper cables placed during this procedure.

52. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed

IG STEP RESPONSE

53. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

54. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lighted.

55. Press the CHART SPEEDS 100 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:
a. CHANNEL 1 to 50 MV/MM

b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 10 MV/MM

56. Set the PHASE SHIFT SELECTOR on the phase sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200~ 0 deg.

57. Connect a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

58. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

59. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

60. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

61. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

62. Record the IG stabilization loop response time on CHANNEL 1 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

MG STEP RESPONSE

63. Set the sensitivities on the Oscillograph Amplifier panel as follows:
a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 50 MV/MM
c. CHANNEL 3 to 10 MV/MM

64. Remove the jumper of step 57 and connect between TB5-18 of TPA #2 and TB2-10 of TPA #2.

65. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

66. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

67. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

68. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

69. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

OG STEP RESPONSE

70. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 50 MV/MM

71. Remove the jumper of step 64 and connect between TB5-18 of TPA #2 and TB2-4 of TPA #2.

72. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

73. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

74. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

75. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

76. Record the OG stabilization loop response time on CHANNEL 3 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance. Remove jumpers connected in step 71.

NORMALIZATION OF SYSTEM

77. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe VERB 23 NOUN 23 Flashing
h. +00000 ENTR

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12220
REV. A
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.50		28.50		
5.a	OG Error signal**	mv	0		60		
5.b	MG Error signal**	mv	0		60		
5.c	IG Error signal**	mv	0		60		
6	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
14	Gyro PVR output voltage	vdc	5.94		6.06		
20	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	vdc	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	vdc	-0.125		+0.125		

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FORM 00145
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12220
REV. A

JOB ____

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34 (cont)	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
50	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	vdc	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
62	IG Stabilization loop response	sec	0		0.8		
	Number of overshoots	number	0		2		
69	MG stabilization loop response	sec	0		0.8		
	Number of overshoots	number	0		2		
76	OG stabilization loop response	sec	0		0.8		
	Number of overshoots	number	0		2		
	AGC Displays	All DSKY displays and indications reacted as specified.					

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FORM 00147
Chg. 7-23-65

69. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

OG STEP RESPONSE

70. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 50 MV/MM

71. Remove the jumper of step 64 and connect between TB5-18 of TPA #2 and TB2-4 of TPA #2.

72. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

73. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

74. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

75. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

76. Record the OG stabilization loop response time on CHANNEL 3 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance. Remove jumpers connected in step 71.

NORMALIZATION OF SYSTEM

77. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe VERB 23 NOUN 23 Flashing
h. +00000 ENTR

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12220
REV. A
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.50		28.50		
5.a	OG Error signal**	mv	0		60		
5.b	MG Error signal**	mv	0		60		
5.c	IG Error signal**	mv	0		60		
6	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
14	Gyro PVR output voltage	vdc	5.94		6.06		
20	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	vdc	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	vdc	-0.125		+0.125		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12220
REV. A

JOB ______

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34 (cont)	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
50	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	vdc	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
62	IG Stabilization loop response	sec	0		0.8		
	Number of overshoots	number	0		2		
69	MG stabilization loop response	sec	0		0.8		
	Number of overshoots	number	0		2		
76	OG stabilization loop response	sec	0		0.8		
	Number of overshoots	number	0		2		
	AGC Displays	All DSKY displays and indications reacted as specified.					

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JOB GIMBAL RESPONSE TEST | **JDC** 12220 **REV.** B **PAGE** 1 **OF** 10
INITIAL TDRR 29882 **D.S. PGS** 2

SUBSYSTEM G & N SYSTEM | **ASSY.**

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored (continued below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	1-12-67	32623	2	1	EA	-
B	2-2-67	32886	All	All	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont)
on the Oscillograph. After the gimbal friction test, the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR
k. VERB 40 NOUN 20 ENTR

4A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00362 ENTR
c. 16002 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB GIMBAL RESPONSE TEST | **JDC** 12220 **REV** B **PAGE** 2 **OF** 10

SUBSYSTEM G & N SYSTEM | **ASSY**

STATIC LOOP PARAMETERS

5. Set the Primary Signal Selector panel to monitor the following signals on PAVM. Record the in-phase voltage for each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG error Signal	134
c. IG Error Signal	135

6. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total voltage value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

7. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 37776 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 37777 ENTR

8. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45 (hi) 49(lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18(lo)

9. Set CHANNEL 3 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

10. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to the LO position.

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JOB GIMBAL RESPONSE TEST | **JDC** 12220 **REV** B **PAGE** 3 **OF** 10

SUBSYSTEM G & N SYSTEM | **ASSY**

11. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 10 MV/MM

12. Connect P2 of W65 to J15 on TPA #2 and set the IRIG SCALE FACTOR switch on the TPA #2 to 1.

13. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

14. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and measure and record the GYRO PVR output on the Current Source Monitor panel per JDC 18016.

15. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

17. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 10 MV/MM

18. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

19. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

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JOB GIMBAL RESPONSE TEST | **JDC** 12220 **REV** B **PAGE** 4 **OF** 10

SUBSYSTEM G & N SYSTEM | **ASSY**

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

20. When the Outer Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

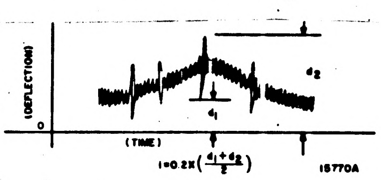

Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, d_2 is the deflection in centimeters measured from zero reference to the maximum peak deflection, and d_1 is the deflection in centimeters measured from zero reference to the minimum peak deflection as shown above.

-IG FRICTION TEST

21. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR
k. Observe VERB 21 NOUN 01 Flashing
m. 37776 ENTR
n. Observe VERB 22 NOUN 01 Flashing
o. 37777 ENTR

22. Remove the jumper from TB1-45 of TPA #2 and place it on TB2-31 of TPA #2.

23. Remove the jumper from TB2-35 of TPA #2 and place it on TB2-47 of TPA #2.

24. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

25. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

26. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

27. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

DATE 30 JUN 66

JOB GIMBAL RESPONSE TEST

JDC 12220 REV. B PAGE 1 OF 10

INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored (continued below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
ⓡ A	1-12-67	32623	2	1	EA	-
B	2-2-67	32886	All	All	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont)
on the Oscillograph. After the gimbal friction test, the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe VERB 41 NOUN 22 Displayed

i. Wait 60 seconds

j. VERB 36 ENTR

k. VERB 40 NOUN 20 ENTR

4A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 00362 ENTR

c. 16002 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

STATIC LOOP PARAMETERS

5. Set the Primary Signal Selector panel to monitor the following signals on PAVM. Record the in-phase voltage for each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG error Signal	134
c. IG Error Signal	135

6. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total voltage value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

7. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00405 ENTR

k. Observe VERB 21 NOUN 01 Flashing

l. 37776 ENTR

m. Observe VERB 22 NOUN 01 Flashing

n. 37777 ENTR

8. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45 (hi) 49(lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18(lo)

9. Set CHANNEL 3 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3

b. OG TM current on CHANNEL 4

c. OG CDU Coarse Error on CHANNEL 5.

10. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to the LO position.

11. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 10 MV/MM

12. Connect P2 of W65 to J15 on TPA #2 and set the IRIG SCALE FACTOR switch on the TPA #2 to 1.

13. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

14. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and measure and record the GYRO PVR output on the Current Source Monitor panel per JDC 18016.

15. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00405 ENTR

k. Observe VERB 21 NOUN 01 Flashing

l. 40001 ENTR

m. Observe VERB 22 NOUN 01 Flashing

n. 40000 ENTR

17. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 10 MV/MM

18. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

19. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

20. When the Outer Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

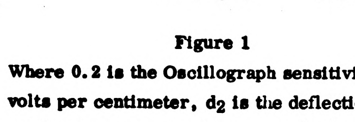

Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, d_2 is the deflection in centimeters measured from zero reference to the maximum peak deflection, and d_1 is the deflection in centimeters measured from zero reference to the minimum peak deflection as shown above.

-IG FRICTION TEST

21. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00407 ENTR

k. Observe VERB 21 NOUN 01 Flashing

m. 37776 ENTR

n. Observe VERB 22 NOUN 01 Flashing

o. 37777 ENTR

22. Remove the jumper from TB1-45 of TPA #2 and place it on TB2-31 of TPA #2.

23. Remove the jumper from TB2-35 of TPA #2 and place it on TB2-47 of TPA #2.

24. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1

b. IG TM Current on CHANNEL 4

c. IG CDU Coarse Error on CHANNEL 5.

25. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

26. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

27. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

28. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

29. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

30. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

33. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

34. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of

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CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

35. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +06750 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00411 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 14000 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 00000 ENTR

36. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

37. Remove the jumper from TB2-31 of TPA #2 and place it on TB2-32 of TPA #2.

38. Remove the jumper from TB2-47 of TPA #2 and place it on TB2-41 of TPA #2.

39. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5

40. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

41. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

42. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

43. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

44. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

45. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

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b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. -06750 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00411 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 63777 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

46. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

47. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

48. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

49. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

50. When the Middle Gimbal indicator appears to stop, in approximately 4 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

51. Remove all jumper cables placed during this procedure.

52. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed

IG STEP RESPONSE

53. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal

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b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

54. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lighted.

55. Press the CHART SPEEDS 100 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

a. CHANNEL 1 to 50 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 10 MV/MM

56. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2, and 3 to 3200 ~ 0 DEG. Set the FILTER switches to HI.

57. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

58. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

59. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

60. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

61. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

62. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

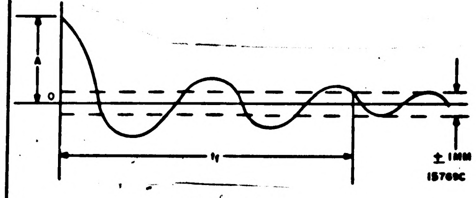

Figure 2

MG STEP RESPONSE

63. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 20 MV/MM
c. CHANNEL 3 to 10 MV/MM

64. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 57 connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

28. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

29. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

30. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

33. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

34. When the Inner Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of

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CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

35. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +06750 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00411 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 14000 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 00000 ENTR

36. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

37. Remove the jumper from TB2-31 of TPA #2 and place it on TB2-32 of TPA #2.

38. Remove the jumper from TB2-47 of TPA #2 and place it on TB2-41 of TPA #2.

39. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5

40. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

41. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

42. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

43. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

44. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

45. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

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b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. -06750 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00411 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 63777 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

46. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

47. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

48. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

49. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

50. When the Middle Gimbal indicator appears to stop, in approximately 4 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

51. Remove all jumper cables placed during this procedure.

52. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed

IG STEP RESPONSE

53. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal

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b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

54. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lighted.

55. Press the CHART SPEEDS 100 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

a. CHANNEL 1 to 50 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 10 MV/MM

56. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2, and 3 to 3200 ~ 0 DEG. Set the FILTER switches to HI.

57. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

58. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

59. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

60. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

61. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

62. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

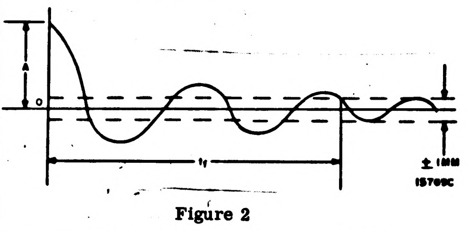

Figure 2

MG STEP RESPONSE

63. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 20 MV/MM
c. CHANNEL 3 to 10 MV/MM

64. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 57 connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

65. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

66. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

67. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

68. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

69. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

70. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 20 MV/MM

71. Connect the 5^V step input to the OG TDA test input by removing the jumper of step 64 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

72. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

73. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

74. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

75. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

76. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value. Remove jumpers connected in step 71.

NORMALIZATION OF SYSTEM

77. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	Observe VERB 21	NOUN 22	Flashing
d.	+00000		ENTR
e.	Observe VERB 22	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe VERB 23	NOUN 23	Flashing
h.	+00000		ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12220
REV. B
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.50		28.50		
5.a	OG Error signal	mv	0		60		
5.b	MG Error signal	mv	0		60		
5.c	IG Error signal	mv	0		60		
6	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
14	Gyro PVR output voltage	vdc	5.94		6.06		
20	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	vdc	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	vdc	-0.125		+0.125		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12220
REV. B

JOB

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34 (cont)	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
50	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	vdc	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
62	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
69	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
76	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
	AGC Displays	All DSKY displays and indications reacted as specified.					

65. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

66. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

67. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

68. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

69. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

70. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 20 MV/MM

71. Connect the 5^V step input to the OG TDA test input by removing the jumper of step 64 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

72. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

73. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

74. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

75. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

76. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value. Remove jumpers connected in step 71.

NORMALIZATION OF SYSTEM

77. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe VERB 23 NOUN 23 Flashing
h. +00000 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12220
REV. B
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.50		28.50		
5.a	OG Error signal	mv	0		60		
5.b	MG Error signal	mv	0		60		
5.c	IG Error signal	mv	0		60		
6	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
14	Gyro PVR output voltage	vdc	5.94		6.06		
20	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	vdc	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	vdc	-0.125		+0.125		

F. RM 0115
Chg. 7-13-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12220
REV. B

JOB ______

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34 (cont)	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
50	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	vdc	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
62	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
69	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
76	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
	AGC Displays	All DSKY displays and indications reacted as specified.					

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored (continued below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	1-12-67	32623	2	1	EA	-
B	2-2-67	32886	All	All	EA	-
C	6-6-67	33907	10	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont)
on the Oscillograph. After the gimbal friction test, the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 220.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR
k. VERB 40 NOUN 20 ENTR

4A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00362 ENTR
c. 16002 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

SUBSYSTEM G & N SYSTEM | ASSY

STATIC LOOP PARAMETERS

5. Set the Primary Signal Selector panel to monitor the following signals on PAVM. Record the in-phase voltage for each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG error Signal	134
c. IG Error Signal	135

6. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total voltage value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

7. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 37776 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 37777 ENTR

8. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45 (hi) 49(lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18(lo)

9. Set CHANNEL 3 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

10. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to the LO position.

SUBSYSTEM G & N SYSTEM | ASSY

11. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 10 MV/MM

12. Connect P2 of W65 to J15 on TPA #2 and set the IRIG SCALE FACTOR switch on the TPA #2 to 1.

13. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

14. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and measure and record the GYRO PVR output on the Current Source Monitor panel per JDC 18016.

15. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

17. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 10 MV/MM

18. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

19. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

SUBSYSTEM G & N SYSTEM | ASSY

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

20. When the Outer Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

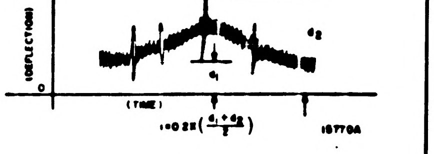

Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, d_2 is the deflection in centimeters measured from zero reference to the maximum peak deflection, and d_1 is the deflection in centimeters measured from zero reference to the minimum peak deflection as shown above.

-IG FRICTION TEST

21. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR
k. Observe VERB 21 NOUN 01 Flashing
m. 37776 ENTR
n. Observe VERB 22 NOUN 01 Flashing
o. 37777 ENTR

22. Remove the jumper from TB1-45 of TPA #2 and place it on TB2-31 of TPA #2.

23. Remove the jumper from TB2-35 of TPA #2 and place it on TB2-47 of TPA #2.

24. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

25. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

26. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

27. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

28. Perform the following DSKY operations:

a. VERB 42		ENTR
b. VERB 33		ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

29. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

30. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. Observe VERB 21	NOUN 01	Flashing
l. 40001		ENTR
m. Observe VERB 22	NOUN 01	Flashing
n. 40000		ENTR

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

33. Perform the following DSKY operations:

a. VERB 42		ENTR
b. VERB 33		ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

34. When the Inner Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of

CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

35. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00411		ENTR
k. Observe VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. Observe VERB 22	NOUN 01	Flashing
n. 00000		ENTR

36. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

37. Remove the jumper from TB2-31 of TPA #2 and place it on TB2-32 of TPA #2.

38. Remove the jumper from TB2-47 of TPA #2 and place it on TB2-41 of TPA #2.

39. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2

b. MG TM Current on CHANNEL 4

c. MG CDU Coarse Error on CHANNEL 5

40. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

41. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

42. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

43. Perform the following DSKY operations:

a. VERB 42		ENTR
b. VERB 33		ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

44. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

45. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00411		ENTR
k. Observe VERB 21	NOUN 01	Flashing
l. 63777		ENTR
m. Observe VERB 22	NOUN 01	Flashing
n. 40000		ENTR

46. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

47. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

48. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

49. Perform the following DSKY operations:

a. VERB 42		ENTR
b. VERB 33		ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

50. When the Middle Gimbal indicator appears to stop, in approximately 4 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

51. Remove all jumper cables placed during this procedure.

52. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed

IG STEP RESPONSE

53. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

54. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lighted.

55. Press the CHART SPEEDS 100 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

a. CHANNEL 1 to 50 MV/MM

b. CHANNEL 2 to 10 MV/MM

c. CHANNEL 3 to 10 MV/MM

56. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2, and 3 to 3200 ~ 0 DEG. Set the FILTER switches to HI.

57. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

58. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. Wait 60 seconds		
j. VERB 36		ENTR

59. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

60. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

61. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

62. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

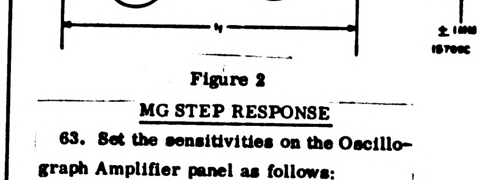

Figure 2

MG STEP RESPONSE

63. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM

b. CHANNEL 2 to 20 MV/MM

c. CHANNEL 3 to 10 MV/MM

64. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 57 connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

65. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. Observe VERB 22 NOUN 22 Flashing
- e. +00000 ENTR
- f. Observe VERB 23 NOUN 22 Flashing
- g. +00000 ENTR
- h. Observe VERB 41 NOUN 22 Displayed
- i. Wait 60 seconds
- j. VERB 36 ENTR

66. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

67. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

68. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

69. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

70. Set the sensitivities on the Oscillograph Amplifier panel as follows:

- a. CHANNEL 1 to 10 MV/MM
- b. CHANNEL 2 to 10 MV/MM
- c. CHANNEL 3 to 20 MV/MM

71. Connect the 5^V step input to the OG TDA test input by removing the jumper of step 64 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

72. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. Observe VERB 22 NOUN 22 Flashing
- e. +00000 ENTR
- f. Observe VERB 23 NOUN 22 Flashing
- g. +00000 ENTR
- h. Observe VERB 41 NOUN 22 Displayed
- i. Wait 60 seconds
- j. VERB 36 ENTR

73. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

74. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

75. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

76. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value. Remove jumpers connected in step 71.

NORMALIZATION OF SYSTEM

77. Perform the following DSKY operations:

- a. VERB 36 ENTR
- b. VERB 41 NOUN 20 ENTR
- c. Observe VERB 21 NOUN 22 Flashing
- d. +00000 ENTR
- e. Observe VERB 22 NOUN 22 Flashing
- f. +00000 ENTR
- g. Observe VERB 23 NOUN 22 Flashing
- h. +00000 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12220
REV. C
INITIAL TDRR 29887

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.50		28.50		
5.a	OG Error signal	mv	0		60		
5.b	MG Error signal	mv	0		60		
5.c	IG Error signal	mv	0		60		
6	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
14	Gyro PVR output voltage	vdc	5.94		6.06		
20	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	vdc	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	vdc	-0.125		+0.125		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12220
REV. C

JOB ______

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34 (cont)	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
50	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	vdc	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
62	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
69	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
76	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
	AGC Displays	All DSKY displays and indications reacted as specified.					

JOB GIMBAL RESPONSE TEST

JDC 12220 **REV.** D **PAGE** 1 **OF** 10

INITIAL TDRR 29882 **D.S. PGS** 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored (continued below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	1-12-67	32623	2	1	EA	-
B	2-2-67	32886	All	All	EA	-
C	6-6-67	33907	10	-	EA	-
D	1-15-68	35427	1-4, 6, 8, 9	All	EA	-

REFERENCES PS-2015000

IMPORTANT Insure that connector assembly (2003099) is connected to CGC test connector.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont) on the Oscillograph. After the gimbal friction test, the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Connect 28 VDC IMU Operate Bus A to DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 173.

3. Measure and record bus voltage. If necessary, adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc.

4. Insure that the Inner, Middle and Outer gimbals are set to 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR
k. VERB 40 NOUN 20 ENTR

4A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00362 ENTR
c. 16002 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB GIMBAL RESPONSE TEST

JDC 12220 **REV** D **PAGE** 2 **OF** 10

SUBSYSTEM G & N SYSTEM

ASSY

STATIC LOOP PARAMETERS

5. Set the Primary Signal Selector panel to monitor the following signals on PAVM. Record the in-phase voltage for each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG error Signal	134
c. IG Error Signal	135

6. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total voltage value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

7. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 37776 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 37777 ENTR

8. Place jumpers between the following points:

OSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45 (hi) 49(lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18(lo)

9. Set CHANNEL 3 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

10. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to the LO position.

DATE 30 JUN 66

JOB GIMBAL RESPONSE TEST

JDC 12220 **REV** D **PAGE** 3 **OF** 10

SUBSYSTEM G & N SYSTEM

ASSY

11. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

12. Connect P2 of W65 to J15 on TPA #2 and set the IRIG SCALE FACTOR switch on the TPA #2 to 1.

13. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

14. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and measure and record the GYRO PVR output on the Current Source Monitor panel per JDC 18016.

15. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

17. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

18. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

19. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

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JOB GIMBAL RESPONSE TEST

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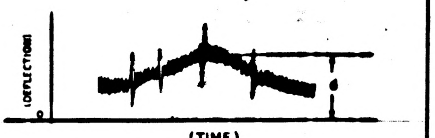
SUBSYSTEM G & N SYSTEM

ASSY

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

20. When the Outer Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.



i = 0.2d

Where: 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to midpoint of trace. Ignore any noise spikes.

Figure 1

-IG FRICTION TEST

21. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR
k. Observe VERB 21 NOUN 01 Flashing
m. 37776 ENTR
n. Observe VERB 22 NOUN 01 Flashing
o. 37777 ENTR

22. Remove the jumper from TB1-45 of TPA #2 and place it on TB2-31 of TPA #2.

23. Remove the jumper from TB2-35 of TPA #2 and place it on TB2-47 of TPA #2.

24. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

25. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

26. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

27. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

DATE 30 JUN 66

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

28. Perform the following DSKY operations:

a.	VERB 42		ENTR
b.	VERB 33		ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

29. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

30. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00407		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
l.	40001		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	40000		ENTR

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

33. Perform the following DSKY operations:

a.	VERB 42		ENTR
b.	VERB 33		ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

34. When the Inner Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of

---

CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

35. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+06750		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00411		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
l.	14000		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	00000		ENTR

36. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

37. Remove the jumper from TB2-31 of TPA #2 and place it on TB2-32 of TPA #2.

38. Remove the jumper from TB2-47 of TPA #2 and place it on TB2-41 of TPA #2.

39. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2

b. MG TM Current on CHANNEL 4

c. MG CDU Coarse Error on CHANNEL 5

40. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

41. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

42. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

43. Perform the following DSKY operations:

a.	VERB 42		ENTR
b.	VERB 33		ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

44. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

45. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	-06750		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00411		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
l.	63777		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	40000		ENTR

---

46. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

47. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

48. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

49. Perform the following DSKY operations:

a.	VERB 42		ENTR
b.	VERB 33		ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

50. When the Middle Gimbal indicator appears to stop, in approximately 4 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

51. Remove all jumper cables placed during this procedure.

52. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed

IG STEP RESPONSE

53. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

---

54. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lighted.

55. Press the CHART SPEEDS 100 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

a. CHANNEL 1 to 50 MV/MM

b. CHANNEL 2 to 10 MV/MM

c. CHANNEL 3 to 10 MV/MM

56. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2, and 3 to 3200 ~ 0 DEG. Set the FILTER switches to HI.

57. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

58. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

59. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

60. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

61. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

62. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

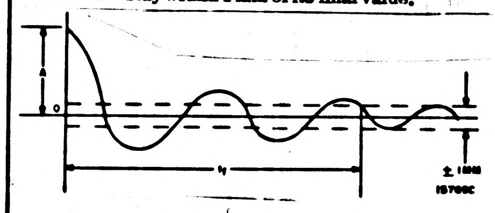


Figure 2

MG STEP RESPONSE

63. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM

b. CHANNEL 2 to 20 MV/MM

c. CHANNEL 3 to 10 MV/MM

64. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 57 connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

65. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

66. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

67. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

68. After observing a constant servo error on CHANNEL 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

69. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

70. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 20 MV/MM

71. Connect the 5^V step input to the OG TDA test input by removing the jumper of step 64 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

72. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

73. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

74. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

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75. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

76. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value. Remove jumpers connected in step 71.

NORMALIZATION OF SYSTEM

77. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	Observe VERB 21	NOUN 22	Flashing
d.	+00000		ENTR
e.	Observe VERB 22	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe VERB 23	NOUN 22	Flashing
h.	+00000		ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12220
REV. D
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC IMU Operate Bus A	vdc	28.3		29.3		
5.a	OG Error signal	mv	0		60		
5.b	MG Error signal	mv	0		60		
5.c	IG Error signal	mv	0		60		
6	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
14	Gyro PVR output voltage	vdc	▨		▨		
20	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	amps	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	amps	-0.125		+0.125		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12220
REV. D

JOB ____

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34 (cont)	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
50	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	amps	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
62	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
69	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
76	Oscillation peaks	▨	▨		5		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
	AGC Displays	All DSKY displays and indications reacted as specified.					

JOB GIMBAL RESPONSE TEST | JDC 12220 REV. E PAGE 1 OF 11
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored (continued below)

	Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
T	A	1-12-67	32623	2	1	EA	-
	B	2-2-67	32886	All	All	EA	-
Ⓜ	C	6-6-67	33907	10	-	EA	-
Ⓝ	D	1-15-68	35427	1-4, 6, 8, 9	All	EA	-
	E	1-17-68	35457	2-10	All	EA	-

REFERENCES PS-2015000

IMPORTANT Insure that connector assembly (2003099) is connected to CGC test connector.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont) on the Oscillograph. After the gimbal friction test, the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Connect 28 VDC IMU Operate Bus A to DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 173.

3. Measure and record bus voltage. If necessary, adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc.

4. Insure that the Inner, Middle and Outer gimbals are set to 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR
k. VERB 40 NOUN 20 ENTR

4A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00362 ENTR
c. 16002 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

STATIC LOOP PARAMETERS

5. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

6. Set REFERENCE switch to 4.

7. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

8. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

9. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

10. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

11. Set Gimbal Servo Test selector on Test Selector panel to 1.

12. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

13. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°).

14. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

15. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

16. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

17. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

18. Calculate the average of the values obtained in steps 14 and 16. Subtract the value recorded in step 8 from the average and record result.

19. Set PAVM to the phase angle value recorded in step 18.

20. Read and record the voltage indicated on PAVM as the IG error in-phase null.

21. Repeat steps 9 through 19 using Gimbal Servo Test position 2 and CROSSBAR CONTROL position 134.

22. Read and record the voltage indicated on PAVM as the MG error in-phase null.

23. Repeat steps 9 through 19 using Gimbal Servo Test position 3 and CROSSBAR CONTROL position 133.

24. Read and record the voltage indicated on PAVM as the OG error in-phase null.

---

25. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total voltage value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

26. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 37776 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 37777 ENTR

27. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45 (hi) 49(lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18(lo)

28. Set CHANNEL 3 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

29. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to the LO position.

---

30. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

31. Connect P2 of W65 to J15 on TPA #2 and set the IRIG SCALE FACTOR switch on the TPA #2 to 1.

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

33. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and measure and record the GYRO PVR output on the Current Source Monitor panel per JDC 18016.

34. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

35. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

36. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

37. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

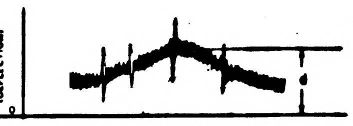
NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

38. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

39. When the Outer Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.



$i = 0.2d$

Where: 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to midpoint of trace. Ignore any noise spikes.

Figure 1

-IG FRICTION TEST

40. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe
VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00407 ENTR

k. Observe
VERB 21 NOUN 01 Flashing

m. 37776 ENTR

n. Observe
VERB 22 NOUN 01 Flashing

o. 37777 ENTR

41. Remove the jumper from TB1-45 of TPA #2 and place it on TB2-31 of TPA #2.

42. Remove the jumper from TB2-35 of TPA #2 and place it on TB2-47 of TPA #2.

43. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1

b. IG TM Current on CHANNEL 4

c. IG CDU Coarse Error on CHANNEL 5.

44. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

45. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

46. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

47. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

48. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

49. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe
VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00407 ENTR

k. Observe
VERB 21 NOUN 01 Flashing

l. 40001 ENTR

m. Observe
VERB 22 NOUN 01 Flashing

n. 40000 ENTR

50. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

51. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

52. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

53. When the Inner Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of

---

CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. +06750 ENTR

h. Observe
VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00411 ENTR

k. Observe
VERB 21 NOUN 01 Flashing

l. 14000 ENTR

m. Observe
VERB 22 NOUN 01 Flashing

n. 00000 ENTR

55. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

56. Remove the jumper from TB2-31 of TPA #2 and place it on TB2-32 of TPA #2.

57. Remove the jumper from TB2-47 of TPA #2 and place it on TB2-41 of TPA #2.

58. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2

b. MG TM Current on CHANNEL 4

c. MG CDU Coarse Error on CHANNEL 5

59. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

60. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

61. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

62. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

63. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

64. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

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b. Observe
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. -06750 ENTR

h. Observe
VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00411 ENTR

k. Observe
VERB 21 NOUN 01 Flashing

l. 63777 ENTR

m. Observe
VERB 22 NOUN 01 Flashing

n. 40000 ENTR

65. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

66. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

67. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

68. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

69. When the Middle Gimbal indicator appears to stop, in approximately 4 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

70. Remove all jumper cables placed during this procedure.

71. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe
VERB 41 NOUN 22 Displayed

IG STEP RESPONSE

72. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal

b. 2-2 MG Error Signal
c. 3-2 OG Error Signal

73. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lighted.

74. Press the CHART SPEEDS 100 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

a. CHANNEL 1 to 50 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 10 MV/MM

75. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2, and 3 to 3200 ~ 0 DEG. Set the FILTER switches to HI.

76. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

77. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

78. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

79. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

80. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

81. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

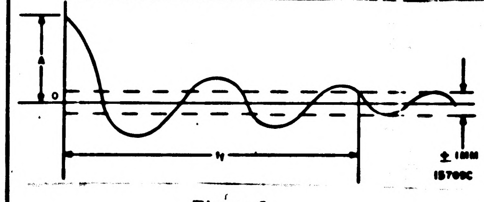

Figure 2

MG STEP RESPONSE

82. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 20 MV/MM
c. CHANNEL 3 to 10 MV/MM

83. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 76 connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

---

84. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

85. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

86. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

87. After observing a constant servo error on CHANNEL 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

88. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

89. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 20 MV/MM

90. Connect the 5^V step input to the OG TDA test input by removing the jumper of step 83 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

91. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

92. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

93. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

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94. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

95. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value. Remove jumpers connected in step 90.

NORMALIZATION OF SYSTEM

96. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe VERB 23 NOUN 22 Flashing
h. +00000 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12220 JDC
REV E
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC IMU Operate Bus A	vdc	28.3		29.3		
8	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
14	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
16	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
18	IG error phase shift	deg	▨		▨		
20	IG error in-phase null	mv	-60		+60		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12220
REV. E

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21(14)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
21(16)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
21(18)	MG error phase shift	deg	▨		▨		
21(20)	MG error in-phase null	mv	-60		+60		
23(14)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
23(16)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
23(18)	OG error phase shift	deg	▨		▨		
23(20)	OG error in-phase null	mv	-60		+60		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12220
REV. E

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
33	Gyro PVR output voltage	vdc	▨		▨		
39	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	amps	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
53	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	amps	-0.125		+0.125		
	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
69	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	amps	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
81	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_r	ms	▨		100		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12220
REV. E

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
88	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_r	ms	▨		100		
95	Oscillation peaks	▨	▨		5		
	Magnitude A	mm	▨		▨	▨	▨
	t_r	ms	▨		100		
	AGC Displays	All DSKY displays and indications reacted as specified.					

DATE 30 JUN 66

JOB GIMBAL RESPONSE TEST

JDC 12220 REV. F PAGE 1 OF 11

INITIAL TDRR 29882 D.S. PGS. 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored (continued below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	1-12-67	32623	2	1	EA	-
B	2-2-67	32886	All	All	EA	-
C	6-6-67	33907	10	-	EA	-
D	1-15-68	35427	1-4, 6, 8, 9	All	EA	-
E	1-17-68	35457	2-10	All	EA	-
F	2-29-68	35773	1, 2	2	EA	-

REFERENCES PS-2015000

IMPORTANT Insure that connector assembly (2003099) is connected to CGC test connector.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont) on the Oscillograph. After the gimbal friction test, the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Connect 28 VDC IMU Operate Bus A to DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 173.

3. Measure and record bus voltage. If necessary, adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc. ______

4. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR
k. VERB 40 NOUN 20 ENTR

4A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00362 ENTR
c. 16002 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

STATIC LOOP PARAMETERS

5. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

6. Set REFERENCE switch to 4.

7. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

8. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

9. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

10. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

11. Set Gimbal Servo Test selector on Test Selector panel to 1 and press to light GIMBAL SERVO TEST pushbutton.

12. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

13. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°).

14. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

15. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

16. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

17. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

18. Calculate the average of the values obtained in steps 14 and 16. Subtract the value recorded in step 8 from the average and record result.

19. Set PAVM to the phase angle value recorded in step 18.

20. Read and record the voltage indicated on PAVM as the IG error in-phase null.

21. Repeat steps 9 through 19 using Gimbal Servo Test position 2 and CROSSBAR CONTROL position 134.

22. Read and record the voltage indicated on PAVM as the MG error in-phase null.

23. Repeat steps 9 through 19 using Gimbal Servo Test position 3 and CROSSBAR CONTROL position 133.

24. Read and record the voltage indicated on PAVM as the OG error in-phase null. ______

---

25. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total voltage value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

26. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 37776 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 37777 ENTR

27. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45 (hi) 49(lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18(lo)

28. Set CHANNEL 3 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

29. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to the LO position.

---

30. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

31. Connect P2 of W65 to J15 on TPA #2 and set the IRIG SCALE FACTOR switch on the TPA #2 to 1.

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

33. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and measure and record the GYRO PVR output on the Current Source Monitor panel per JDC 18016.

34. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

35. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

36. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

37. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

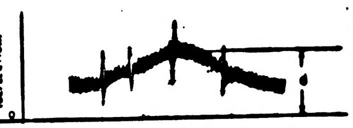
NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

38. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

39. When the Outer Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.



i=0.2d

Where: 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to midpoint of trace. Ignore any noise spikes.

Figure 1

-IG FRICTION TEST

40. Perform the following DSKY operations:

a. VERB 41	NOUN 20		ENTR
b. Observe VERB 21	NOUN 22	Flashing	
c. +00000			ENTR
d. Observe VERB 22	NOUN 22	Flashing	
e. +00000			ENTR
f. Observe VERB 23	NOUN 22	Flashing	
g. +00000			ENTR
h. Observe VERB 41	NOUN 22	Displayed	
i. VERB 24	NOUN 01		ENTR
j. 00407			ENTR
k. Observe VERB 21	NOUN 01	Flashing	
m. 37776			ENTR
n. Observe VERB 22	NOUN 01	Flashing	
o. 37777			ENTR

41. Remove the jumper from TB1-45 of TPA #2 and place it on TB2-31 of TPA #2.

42. Remove the jumper from TB2-35 of TPA #2 and place it on TB2-47 of TPA #2.

43. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1

b. IG TM Current on CHANNEL 4

c. IG CDU Coarse Error on CHANNEL 5.

44. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

45. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

46. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

47. Perform the following DSKY operations:

a. VERB 42		ENTR
b. VERB 33		ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

48. When the Inner Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

49. Perform the following DSKY operations:

a. VERB 41	NOUN 20		ENTR
b. Observe VERB 21	NOUN 22	Flashing	
c. +00000			ENTR
d. Observe VERB 22	NOUN 22	Flashing	
e. +00000			ENTR
f. Observe VERB 23	NOUN 22	Flashing	
g. +00000			ENTR
h. Observe VERB 41	NOUN 22	Displayed	
i. VERB 24	NOUN 01		ENTR
j. 00407			ENTR
k. Observe VERB 21	NOUN 01	Flashing	
l. 40001			ENTR
m. Observe VERB 22	NOUN 01	Flashing	
n. 40000			ENTR

50. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

51. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

52. Perform the following DSKY operations:

a. VERB 42		ENTR
b. VERB 33		ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

53. When the Inner Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of

CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20		ENTR
b. Observe VERB 21	NOUN 22	Flashing	
c. +00000			ENTR
d. Observe VERB 22	NOUN 22	Flashing	
e. +00000			ENTR
f. Observe VERB 23	NOUN 22	Flashing	
g. +06750			ENTR
h. Observe VERB 41	NOUN 22	Displayed	
i. VERB 24	NOUN 01		ENTR
j. 00411			ENTR
k. Observe VERB 21	NOUN 01	Flashing	
l. 14000			ENTR
m. Observe VERB 22	NOUN 01	Flashing	
n. 00000			ENTR

55. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

56. Remove the jumper from TB2-31 of TPA #2 and place it on TB2-32 of TPA #2.

57. Remove the jumper from TB2-47 of TPA #2 and place it on TB2-41 of TPA #2.

58. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2

b. MG TM Current on CHANNEL 4

c. MG CDU Coarse Error on CHANNEL 5

59. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

60. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

61. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

62. Perform the following DSKY operations:

a. VERB 42		ENTR
b. VERB 33		ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

63. When the Middle Gimbal indicator appears to stop, in approximately 4 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

64. Perform the following DSKY operations:

a. VERB 41	NOUN 20		ENTR

b. Observe VERB 21	NOUN 22	Flashing	
c. +00000			ENTR
d. Observe VERB 22	NOUN 22	Flashing	
e. +00000			ENTR
f. Observe VERB 23	NOUN 22	Flashing	
g. -06750			ENTR
h. Observe VERB 41	NOUN 22	Displayed	
i. VERB 24	NOUN 01		ENTR
j. 00411			ENTR
k. Observe VERB 21	NOUN 01	Flashing	
l. 63777			ENTR
m. Observe VERB 22	NOUN 01	Flashing	
n. 40000			ENTR

65. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

66. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

67. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

68. Perform the following DSKY operations:

a. VERB 42		ENTR
b. VERB 33		ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

69. When the Middle Gimbal indicator appears to stop, in approximately 4 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

70. Remove all jumper cables placed during this procedure.

71. Perform the following DSKY operations:

a. VERB 41	NOUN 20		ENTR
b. Observe VERB 21	NOUN 22	Flashing	
c. +00000			ENTR
d. Observe VERB 22	NOUN 22	Flashing	
e. +00000			ENTR
f. Observe VERB 23	NOUN 22	Flashing	
g. +00000			ENTR
h. Observe VERB 41	NOUN 22	Displayed	

IG STEP RESPONSE

72. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal

b. 2-2 MG Error Signal
c. 3-2 OG Error Signal

73. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lighted.

74. Press the CHART SPEEDS 100 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

a. CHANNEL 1 to 50 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 10 MV/MM

75. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2, and 3 to 3200 ~ 0 DEG. Set the FILTER switches to HI.

76. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

77. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR	
b. Observe VERB 21	NOUN 22	Flashing	
c. +00000		ENTR	
d. Observe VERB 22	NOUN 22	Flashing	
e. +00000		ENTR	
f. Observe VERB 23	NOUN 22	Flashing	
g. +00000		ENTR	
h. Observe VERB 41	NOUN 22	Displayed	
i. Wait 60 seconds			
j. VERB 36		ENTR	

78. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

79. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

80. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

81. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

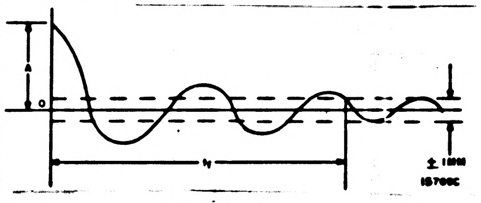


Figure 2

MG STEP RESPONSE

82. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 20 MV/MM
c. CHANNEL 3 to 10 MV/MM

83. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 76 connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

---

84. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. Wait 60 seconds		
j. VERB 36		ENTR

85. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

86. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

87. After observing a constant servo error on CHANNEL 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

88. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

89. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 20 MV/MM

90. Connect the 5^V step input to the OG TDA test input by removing the jumper of step 83 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

91. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. Wait 60 seconds		
j. VERB 36		ENTR

92. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

93. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

---

94. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

95. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value. Remove jumpers connected in step 90.

NORMALIZATION OF SYSTEM

96. Perform the following DSKY operations:

a. VERB 36		ENTR
b. VERB 41	NOUN 20	ENTR
c. Observe VERB 21	NOUN 22	Flashing
d. +00000		ENTR
e. Observe VERB 22	NOUN 22	Flashing
f. +00000		ENTR
g. Observe VERB 23	NOUN 22	Flashing
h. +00000		ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12220
REV F
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC IMU Operate Bus A	vdc	28.3		29.3		
8	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
14	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
16	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
18	IG error phase shift	deg	▨		▨		
20	IG error in-phase null	mv	-60		+60		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12220
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21(14)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
21(16)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
21(18)	MG error phase shift	deg	▨		▨		
22	MG error in-phase null	mv	-60		+60		
23(14)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
23(16)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
23(18)	OG error phase shift	deg	▨		▨		
24	OG error in-phase null	mv	-60		+60		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12220
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
33	Gyro PVR output voltage	vdc	▨		▨		
39	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	amps	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
53	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	amps	-0.125		+0.125		
	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
69	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	amps	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
81	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12220
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
88	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
95	Oscillation peaks	▨	▨		5		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
	AGC Displays	All DSKY displays and indications reacted as specified.					

DATE 30 JUN 66

JOB GIMBAL RESPONSE TEST | JDC 12220 REV. G PAGE 1 OF 11
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored (continued below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	1-12-67	32623	2	1	EA	-
B	2-2-67	32886	All	All	EA	-
C	6-6-67	33907	10	-	EA	-
D	1-15-68	35427	1-4, 6, 8, 9	All	EA	-
E	1-17-68	35457	2-10	All	EA	-
F	2-29-68	35773	1, 2	2	EA	-
G	10-21-68	36927	1	-	EA	-

REFERENCES PS-2015000

IMPORTANT Insure that connector assembly (2003099) is connected to CGC test connector.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont) on the Oscillograph. After the gimbal friction test, the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

NOTE: Oscillograph sensitivities given in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Connect 28 VDC IMU Operate Bus A to DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 173.

3. Measure and record bus voltage. If necessary, adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc.

4. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR
k. VERB 40 NOUN 20 ENTR

4A. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

b. 00362 ENTR
c. 16002 ENTR

STATIC LOOP PARAMETERS

5. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

6. Set REFERENCE switch to 4.

7. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

8. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

9. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

10. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

11. Set Gimbal Servo Test selector on Test Selector panel to 1 and press to light GIMBAL SERVO TEST pushbutton.

12. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

13. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

14. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

15. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

16. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

17. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

18. Calculate the average of the values obtained in steps 14 and 16. Subtract the value recorded in step 8 from the average and record result.

19. Set PAVM to the phase angle value recorded in step 18.

20. Read and record the voltage indicated on PAVM as the IG error in-phase null.

21. Repeat steps 9 through 19 using Gimbal Servo Test position 2 and CROSSBAR CONTROL position 134.

22. Read and record the voltage indicated on PAVM as the MG error in-phase null.

23. Repeat steps 9 through 19 using Gimbal Servo Test position 3 and CROSSBAR CONTROL position 133.

24. Read and record the voltage indicated on PAVM as the OG error in-phase null.

25. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total voltage value of each:

	Voltage	CROSSBAR CONTROL
a.	OG TDA	136
b.	MG TDA	137
c.	IG TDA	138

-OG FRICTION

26. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 37776 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 37777 ENTR

27. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45 (hi) 49(lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18(lo)

28. Set CHANNEL 3 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

29. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to the LO position.

30. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

31. Connect P2 of W65 to J15 on TPA #2 and set the IRIG SCALE FACTOR switch on the TPA #2 to 1.

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

33. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and measure and record the GYRO PVR output on the Current Source Monitor panel per JDC 18016.

34. When the Outer Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

35. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

36. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

37. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

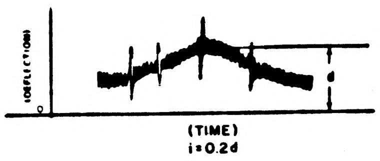
NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

38. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

39. When the Outer Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.



Where: 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to midpoint of trace. Ignore any noise spikes.

Figure 1

-IG FRICTION TEST

40. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00407		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
m.	37776		ENTR
n.	Observe VERB 22	NOUN 01	Flashing
o.	37777		ENTR

41. Remove the jumper from TB1-45 of TPA #2 and place it on TB2-31 of TPA #2.

42. Remove the jumper from TB2-35 of TPA #2 and place it on TB2-47 of TPA #2.

43. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

44. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

45. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

46. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

47. Perform the following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

48. When the Inner Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

49. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00407		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
l.	40001		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	40000		ENTR

50. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

51. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

52. Perform the following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

53. When the Inner Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of

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CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

54. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+06750		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00411		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
l.	14000		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	00000		ENTR

55. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

56. Remove the jumper from TB2-31 of TPA #2 and place it on TB2-32 of TPA #2.

57. Remove the jumper from TB2-47 of TPA #2 and place it on TB2-41 of TPA #2.

58. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5

59. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

60. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

61. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

62. Perform the following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

63. When the Middle Gimbal indicator appears to stop, in approximately 4 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

64. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR

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b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	-06750		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00411		ENTR
k.	Observe VERB 21	NOUN 01	Flashing
l.	63777		ENTR
m.	Observe VERB 22	NOUN 01	Flashing
n.	40000		ENTR

65. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

66. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

67. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

68. Perform the following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

69. When the Middle Gimbal indicator appears to stop, in approximately 4 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

70. Remove all jumper cables placed during this procedure.

71. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed

IG STEP RESPONSE

72. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal

b. 2-2 MG Error Signal

c. 3-2 OG Error Signal

73. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lighted.

74. Press the CHART SPEEDS 100 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

a. CHANNEL 1 to 50 MV/MM

b. CHANNEL 2 to 10 MV/MM

c. CHANNEL 3 to 10 MV/MM

75. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2, and 3 to 3200 ~ 0 DEG. Set the FILTER switches to HI.

76. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

77. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

78. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

79. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

80. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

81. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

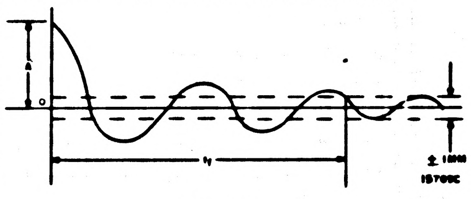

Figure 2

MG STEP RESPONSE

82. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM

b. CHANNEL 2 to 20 MV/MM

c. CHANNEL 3 to 10 MV/MM

83. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 76 connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

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84. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

85. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

86. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

87. After observing a constant servo error on CHANNEL 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

88. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

89. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM

b. CHANNEL 2 to 10 MV/MM

c. CHANNEL 3 to 20 MV/MM

90. Connect the 5^V step input to the OG TDA test input by removing the jumper of step 83 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

91. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

92. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

93. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

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94. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

95. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value. Remove jumpers connected in step 90.

NORMALIZATION OF SYSTEM

96. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	Observe VERB 21	NOUN 22	Flashing
d.	+00000		ENTR
e.	Observe VERB 22	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe VERB 23	NOUN 22	Flashing
h.	+00000		ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12220 JDC
REV G
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME / AFFILIATION APPROVED BY ______ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC IMU Operate Bus A	vdc	28.3		29.3		
8	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
14	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
16	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
18	IG error phase shift	deg	▨		▨		
20	IG error in-phase null	mv	-60		+60		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12220
REV. G

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
21(14)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
21(16)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
21(18)	MG error phase shift	deg	▨		▨		
22	MG error in-phase null	mv	-60		+60		
23(14)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
23(16)	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
23(18)	OG error phase shift	deg	▨		▨		
24	OG error in-phase null	mv	-60		+60		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12220
REV. G

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
25	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
33	Gyro PVR output voltage	vdc	▨		▨		
39	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	amps	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
53	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	amps	-0.125		+0.125		
	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
69	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	amps	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
81	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12220
REV. G

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
88	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
95	Oscillation peaks	▨	▨		5		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
	AGC Displays	All DSKY displays and indications reacted as specified.					

DATE 30 JUN 66

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JOB GIMBAL RESPONSE TEST

INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor currents are monitored on the Oscillograph. After the gimbal friction test, the OG, MG, and IG stabilization loop responses are tested by providing a step input to each DC stabilization amplifier.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	1-12-67	32623	2	1	EA	-
B	2-2-67	32886	All	All	EA	-
C	6-6-67	33907	10	-	EA	-
D	1-15-68	35427	1-4, 6, 8, 9	All	EA	-
E	1-17-68	35457	2-10	All	EA	-
F	2-29-68	35773	1, 2	2	EA	-
G	10-21-68	36927	1	-	EA	-
H	11-12-68	37019	All	All	EA	-

REFERENCES

PS-2015000

IMPORTANT

See below

INTERVAL

TOOLS AND MATERIAL

See appropriate section of JDC

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector before proceeding.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12220 CTS UPLINK Tape P/N 2901650 -001

NOTE: Prepare the CGC for the UPLINK code by establishing the following conditions on the CTS:

a. Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

b. Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

c. Set digitswitches on Self Test Assembly to 00000.

d. Self Test Panel -
Press to light SELF TEST pushbutton.

e. Tape Reader -
Set Power switch to ON. Load the CTS UPLINK tape.

f. Programmer and Monitor panel -
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

g. RDC Interface panel -
Press to light CH33-10 pushbutton.

h. XY Interface panel -
Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

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MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

1. Programmer and Monitor panel -
Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Connect 28 VDC IMU Operate Bus A to Digital Voltmeter (DVM) by setting CROSSBAR CONTROL on Primary Signal Selector panel to 173.

3. Measure and record bus voltage. If necessary, adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc.

4. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR
k.	VERB 40	NOUN 20	ENTR

4. Press EXECUTE pushbutton on Programmer and Monitor panel.

4A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM G & N SYSTEM **ASSY**

MANUAL LOAD PROCEDURES

5. Perform following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	00362		ENTR
c.	16002		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

STATIC LOOP PARAMETERS

6. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

7. Set REFERENCE switch to 4.

8. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

12. Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and press to light GIMBAL SERVO TEST pushbutton.

13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

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MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

14. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

18. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

19. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

20. Set PAVM to the phase angle value recorded in step 19.

21. Measure and record the voltage indicated on PAVM as the IG error in-phase null.

22. Connect MG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.

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MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

23. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.

24. Set GIMBAL SERVO TEST switch on Test Selector panel to 2.

25. Apply square wave input to MG loop by pressing TEST START pushbutton on Test Selector panel.

26. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°).

27. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

28. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

29. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

30. Remove input from MG loop by pressing TEST STOP pushbutton on Test Selector panel.

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MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

31. Calculate the average of the values obtained in steps 27 and 29. Subtract the value recorded in step 9 from the average and record result.

32. Set PAVM to the phase angle value recorded in step 31.

33. Measure and record the voltage indicated on PAVM as the MG error in-phase null.

34. Connect OG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.

35. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.

36. Set GIMBAL SERVO TEST switch on Test Selector panel to 3.

37. Apply square wave input to OG loop by pressing TEST START pushbutton on Test Selector panel.

38. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

39. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

40. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph

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MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions on the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

41. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

42. Remove input from OG loop by pressing TEST STOP pushbutton on Test Selector panel.

43. Calculate the average of the values obtained in steps 39 and 41. Subtract the value recorded in step 9 from the average and record result.

44. Set PAVM to the phase angle value recorded in step 43.

45. Measure and record the voltage indicated on PAVM as the OG error in-phase null.

46. Set CROSSBAR CONTROL on Primary Signal Selector panel to following positions to monitor the corresponding voltages. Record the total voltage value of each:

	CROSSBAR CONTROL	Voltage
a.	136	OG TDA
b.	137	MG TDA
c.	138	IG TDA

-OG FRICTION TEST

47. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

-OG FRICTION TEST

47. Press EXECUTE pushbutton on Programmer and Monitor panel.

47A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe
VERB 21 NOUN 01 Flashing
l. 37776 ENTR
m. Observe
VERB 22 NOUN 01 Flashing
n. 37777 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

47B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

48. Connect jumpers between following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45(hi) TB1-49(lo)
TPA#2	BUFFERED PROBE	TB2-35(hi) TB2-18(lo)

49. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. OG CDU Fine Error on Channel 3

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

b. OG TM Current on Channel 4

c. OG CDU Coarse Error on Channel 5.

50. Insure that CH3AC, CH4DC, and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted. Insure that PHASE SHIFT SELECTOR switches on Oscillograph Phase Sensitive Demodulators for Channels 1, 2, 3, and 5 are set to 800 ~ 0 DEG and FILTER switches are set to LO.

51. Connect P2 of W65 to J15 on TPA#2 and set IRIG SCALE FACTOR switch on TPA#2 to 1.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 52. Perform steps 53 and 54 during this time.

52. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 52. Perform steps 53 and 54 during this time.

52. Press EXECUTE pushbutton on Programmer and Monitor panel.

53. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

54. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

55. When Outer Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph

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MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

Control panel to MM/SEC and measure and record the GYRO PVR output on Current Source Monitor panel per JDC 18216.

56. When Outer Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

+ OG FRICTION TEST

57. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe
VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe
VERB 22 NOUN 01 Flashing
n. 40000 ENTR

+ OG FRICTION TEST

57. Press EXECUTE pushbutton on Programmer and Monitor panel.

57A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 58. Perform steps 59 and 60 during this time.

58. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 58. Perform steps 59 and 60 during this time.

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. Set sensitivities on Oscillograph Amplifiers as follows:

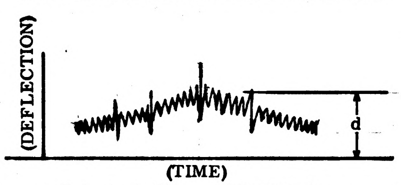
a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

60. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

61. When Outer Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

62. When Outer Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels 3 and 5. Using equation given in Figure 1, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES



i = 0.2d Where: 0.2 is Oscillograph sensitivity in volts per centimeter. d is deflection in centimeters measured from zero reference to midpoint of trace. Ignore any noise spikes.

Figure 1

MANUAL LOAD PROCEDURES

-IG FRICTION TEST

63. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00407		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

-IG FRICTION TEST

63. Press EXECUTE pushbutton on Programmer and Monitor panel.

63A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

63B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

63C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

63D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

k.	Observe		
	VERB 21	NOUN 01	Flashing
l.	37776		ENTR
m.	Observe		
	VERB 22	NOUN 01	Flashing
n.	37777		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

63E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

63F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

64. Remove jumper from TB1-45 of TPA#2 and connect it to TB2-31 on TPA#2.

65. Remove jumper from TB2-35 of TPA#2 and connect it to TB2-47 on TPA#2.

66. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. IG CDU Fine Error on Channel 1
b. IG TM Current on Channel 4
c. IG CDU Coarse Error on Channel 5.

67. Insure that CH4DC and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted.

MANUAL LOAD PROCEDURES

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 68. Perform steps 69 and 70 during this time.

68. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 68. Perform steps 69 and 70 during this time.

68. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

69. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

70. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

71. When Inner Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

72. When Inner Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

MANUAL LOAD PROCEDURES

+IG FRICTION TEST

73. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00407		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

+IG FRICTION TEST

73. Press EXECUTE pushbutton on Programmer and Monitor panel.

73A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

k.	Observe		
	VERB 21	NOUN 01	Flashing
l.	40001		ENTR
m.	Observe		
	VERB 22	NOUN 01	Flashing
n.	40000		ENTR

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 74. Perform steps 75 and 76 during this time.

74. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

CTS UPLINK TAPE LOAD PROCEDURES

73E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 74. Perform steps 75 and 76 during this time.

74. Press EXECUTE pushbutton on Programmer and Monitor panel.

75. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

76. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

77. When Inner Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

78. When Inner Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels 1 and 5.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES

Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

-MG FRICTION TEST	-MG FRICTION TEST
79. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR	79. Press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR	79A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe VERB 22 NOUN 22 Flashing e. +00000 ENTR	79B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. Observe VERB 23 NOUN 22 Flashing g. +06750 ENTR	79C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
h. Observe VERB 41 NOUN 22 Displayed i. VERB 24 NOUN 01 ENTR j. 00411 ENTR	79D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
k. Observe VERB 21 NOUN 01 Flashing l. 14000 ENTR	79E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
m. Observe VERB 22 NOUN 01 Flashing n. 00000 ENTR	79F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

80. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall be lighted.

81. Remove the jumper from TB2-31 of TPA#2 and connect it to TB2-32 of TPA#2.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES

82. Remove the jumper from TB2-47 of TPA#2 and connect it to TB2-41 of TPA#2.

83. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. MG CDU Fine Error on Channel 2
b. MG TM Current on Channel 4
c. MG CDU Coarse Error on Channel 5.

84. Insure that CH4DC and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted.

NOTE: Middle gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 85. Perform steps 86 and 87 during this time.	NOTE: Middle gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 85. Perform steps 86 and 87 during this time.
85. Perform following DSKY operations: a. VERB 42 ENTR b. VERB 33 ENTR	85. Press EXECUTE pushbutton on Programmer and Monitor panel.

86. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

87. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

88. When Middle Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES

89. When Middle Gimbal indicator appears to stop, in approximately 4 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

+MG FRICTION TEST	+MG FRICTION TEST
90. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR	90. Press EXECUTE pushbutton on Programmer and Monitor panel
b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR	90A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe VERB 22 NOUN 22 Flashing e. +00000 ENTR	90B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. Observe VERB 23 NOUN 22 Flashing g. -06750 ENTR	90C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
h. Observe VERB 41 NOUN 22 Displayed i. VERB 24 NOUN 01 ENTR j. 00411 ENTR	90D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
k. Observe VERB 21 NOUN 01 Flashing l. 63777 ENTR	90E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
m. Observe VERB 22 NOUN 01 Flashing n. 40000 ENTR	90F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

91. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

NOTE: Middle gimbal pulse torquing will start approximately 90 seconds	NOTE: Middle gimbal pulse torquing will start approximately 90 seconds

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
after performance of DSKY operations in step 92. Perform steps 93 and 94 during this time.	after pressing EXECUTE pushbutton in step 92. Perform steps 93 and 94 during this time.
92. Perform following DSKY operations: a. VERB 42 ENTR b. VERB 33 ENTR	92. Press EXECUTE pushbutton on Programmer and Monitor panel.

93. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

94. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

95. When Middle Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

96. When Middle Gimbal indicator appears to stop, in approximately 4 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record the maximum amplitude (neglect spikes) of Channels 2 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

97. Remove all jumper cables installed during this procedure.

MANUAL LOAD PROCEDURES

98. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed

CTS UPLINK TAPE LOAD PROCEDURES

98. Press EXECUTE pushbutton on Programmer and Monitor panel.

98A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

98B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

98C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. Observe that VERB 41 NOUN 22 are displayed on DSKY.

IG STEP RESPONSE

99. Set CHANNEL 1, 2, and 3 switches on Oscillograph Signal Selector panel to 2 to monitor following signals:

a. IG&Y Gyro error signal on Channel 1
b. MG error signal on Channel 2
c. OG error signal on Channel 3.

100. Insure that CH3AC pushbutton on Oscillograph Signal Selector panel is lighted.

101. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 50 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 10 MV/MM.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

102. Set PHASE SHIFT SELECTOR on Phase Sensitive Demodulators of CHANNELS 1, 2, and 3 to 3200 ~ 0 DEG and set FILTER switches to HI.

103. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 and TB2-11 on TPA#2.

104. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

104. Press EXECUTE pushbutton on Programmer and Monitor panel.

104A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

104B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

104C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

104D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

105. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

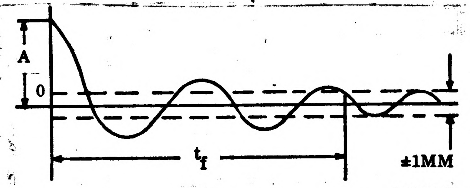

Figure 2

106. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

107. After observing a constant servo error on Channel 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

108. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

MG STEP RESPONSE

109. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 20 MV/MM
c. CHANNEL 3 to 10 MV/MM.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

110. Apply the 5V step input to the MG TDA test input by removing the jumper connected in step 103 and connecting it between TB5-18 and TB2-10 on TPA#2.

111. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

111. Press EXECUTE pushbutton on Programmer and Monitor panel.

111A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

111B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

111C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

111D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

112. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

113. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

114. After observing a constant servo error on Channel 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

115. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

116. Set sensitivities on Oscilloscope Amplifiers as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 20 MV/MM.

117. Connect the 5V step input to the OG TDA test input by removing the jumper connected in step 110 and connecting it between TB5-18 and TB2-4 on TPA#2.

118. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR	
b. Observe			
VERB 21	NOUN 22	Flashing	
c. +00000		ENTR	
d. Observe			
VERB 22	NOUN 22	Flashing	
e. +00000		ENTR	
f. Observe			
VERB 23	NOUN 22	Flashing	
g. +00000		ENTR	
h. Observe			
VERB 41	NOUN 22	Displayed	
i. Wait 60 seconds			
j. VERB 36		ENTR	

118. Press EXECUTE pushbutton on Programmer and Monitor panel.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

119. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

120. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

121. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

122. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value. Remove jumper connected in step 117.

NORMALIZATION OF SYSTEM

123. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 41	NOUN 20	ENTR
c. Observe		
VERB 21	NOUN 22	Flashing
d. +00000		ENTR
e. Observe		
VERB 22	NOUN 22	Flashing

NORMALIZATION OF SYSTEM

123. Press EXECUTE pushbutton on Programmer and Monitor panel.

123A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

123B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

f. +00000		ENTR
g. Observe		
VERB 23	NOUN 22	Flashing
h. +00000		ENTR

123C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

124. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

125. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

126. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press to light MONITOR pushbutton. AGC INPUT-CTR pushbutton shall go out.

127. Set Power switch on Tape Reader to OFF and remove tape.

128. Press to extinguish SELF TEST pushbutton on Self Test panel.

129. Remove Self Test Assembly from Buffer Box Assembly. Connect cable W226 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12220 JDC
REV H
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC IMU Operate Bus A	vdc	28.3		29.3		
9	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
15	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
17	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
19	IG error phase shift	deg	▨		▨		
21	IG error in-phase null	mv	-60		+60		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12220
REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
27	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
29	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
31	MG error phase shift	deg	▨		▨		
33	MG error in-phase null	mv	-60		+60		
39	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
41	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
43	OG error phase shift	deg	▨		▨		
45	OG error in-phase null	mv	-60		+60		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12220
REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
46	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
55	Gyro PVR output voltage	vdc	▨		▨		
62	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	amps	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
78	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	amps	-0.125		+0.125		
	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
96	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	amps	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
108	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12220
REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
115	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
122	Oscillation peaks	▨	▨		5		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
	AGC Displays	All DSKY displays and indications reacted as specified.					

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JOB GIMBAL RESPONSE TEST | JDC 12220 REV. J PAGE 1 OF 27
INITIAL TDRR 29882 D.S. PGS 4

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor currents are monitored on the Oscillograph. After the gimbal friction test, the OG, MG, and IG stabilization loop responses are tested by providing a step input to each DC stabilization amplifier.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	1-12-67	32623	2	1	EA	-
B	2-2-67	32886	All	All	EA	-
C	6-6-67	33907	10	-	EA	-
D	1-15-68	35427	1-4, 6, 8, 9	All	EA	-
E	1-17-68	35457	2-10	All	EA	-
F	2-29-68	35773	1, 2	2	EA	-
G	10-21-68	36927	1	-	EA	-
H	11-12-68	37019	All	All	EA	-
J	12-3-68	37083	2, 27	-	EA	-

REFERENCES
PS-2015000

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL
See appropriate section of JDC

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector before proceeding.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB GIMBAL RESPONSE TEST | JDC 12220 REV J PAGE 2 OF 27

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12220 CTS UPLINK Tape P/N 2901650 -001

NOTE: Prepare the CGC for the UPLINK code by establishing the following conditions on the CTS:

a. Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

b. Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

c. Set digitswitches on Self Test Assembly to 00000.

d. Self Test Panel -
Press to light SELF TEST pushbutton.

e. Tape Reader -
Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

f. Programmer and Monitor panel -
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

g. RDC Interface panel -
Press to light CH33-10 pushbutton.

h. XY Interface panel -
Press to light POSITIVE, NEGATIVE,

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JOB GIMBAL RESPONSE TEST | JDC 12220 REV J PAGE 3 OF 27

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

i. Programmer and Monitor panel -
Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Connect 28 VDC IMU Operate Bus A to Digital Voltmeter (DVM) by setting CROSSBAR CONTROL on Primary Signal Selector panel to 173.

3. Measure and record bus voltage. If necessary, adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc.

4. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR
k.	VERB 40	NOUN 20	ENTR

4. Press EXECUTE pushbutton on Programmer and Monitor panel.

4A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

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JOB GIMBAL RESPONSE TEST | JDC 12220 REV J PAGE 4 OF 27

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

5. Perform following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	00362		ENTR
c.	16002		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

STATIC LOOP PARAMETERS

6. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

7. Set REFERENCE switch to 4.

8. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

12. Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and press to light GIMBAL SERVO TEST pushbutton.

13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

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14. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

18. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

19. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

20. Set PAVM to the phase angle value recorded in step 19.

21. Measure and record the voltage indicated on PAVM as the IG error in-phase null.

22. Connect MG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.

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23. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.

24. Set GIMBAL SERVO TEST switch on Test Selector panel to 2.

25. Apply square wave input to MG loop by pressing TEST START pushbutton on Test Selector panel.

26. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°).

27. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

28. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

29. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

30. Remove input from MG loop by pressing TEST STOP pushbutton on Test Selector panel.

---

31. Calculate the average of the values obtained in steps 27 and 29. Subtract the value recorded in step 9 from the average and record result.

32. Set PAVM to the phase angle value recorded in step 31.

33. Measure and record the voltage indicated on PAVM as the MG error in-phase null.

34. Connect OG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.

35. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.

36. Set GIMBAL SERVO TEST switch on Test Selector panel to 3.

37. Apply square wave input to OG loop by pressing TEST START pushbutton on Test Selector panel.

38. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

39. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

40. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph

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Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions on the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

41. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

42. Remove input from OG loop by pressing TEST STOP pushbutton on Test Selector panel.

43. Calculate the average of the values obtained in steps 39 and 41. Subtract the value recorded in step 9 from the average and record result.

44. Set PAVM to the phase angle value recorded in step 43.

45. Measure and record the voltage indicated on PAVM as the OG error in-phase null.

46. Set CROSSBAR CONTROL on Primary Signal Selector panel to following positions to monitor the corresponding voltages. Record the total voltage value of each:

	CROSSBAR CONTROL	Voltage
a.	136	OG TDA
b.	137	MG TDA
c.	138	IG TDA

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
-OG FRICTION TEST	-OG FRICTION TEST
47. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR	47. Press EXECUTE pushbutton on Programmer and Monitor panel. 47A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

JOB GIMBAL RESPONSE TEST | JDC 12220 REV J PAGE 9 OF 27

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00405		ENTR
k.	Observe		
	VERB 21	NOUN 01	Flashing
l.	37776		ENTR
m.	Observe		
	VERB 22	NOUN 01	Flashing
n.	37777		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

47B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

48. Connect jumpers between following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45(hi) TB1-49(lo)
TPA#2	BUFFERED PROBE	TB2-35(hi) TB2-18(lo)

49. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. OG CDU Fine Error on Channel 3

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MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

b. OG TM Current on Channel 4

c. OG CDU Coarse Error on Channel 5.

50. Insure that CH3AC, CH4DC, and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted. Insure that PHASE SHIFT SELECTOR switches on Oscillograph Phase Sensitive Demodulators for Channels 1, 2, 3, and 5 are set to 800 ~ 0 DEG and FILTER switches are set to LO.

51. Connect P2 of W65 to J15 on TPA#2 and set IRIG SCALE FACTOR switch on TPA#2 to 1.

MANUAL LOAD PROCEDURES

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 52. Perform steps 53 and 54 during this time.

52. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 52. Perform steps 53 and 54 during this time.

52. Press EXECUTE pushbutton on Programmer and Monitor panel.

53. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM.

54. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

55. When Outer Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph

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Control panel to MM/SEC and measure and record the GYRO PVR output on Current Source Monitor panel per JDC 18216.

56. When Outer Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

+ OG FRICTION TEST

57. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00405		ENTR
k.	Observe		
	VERB 21	NOUN 01	Flashing
l.	40001		ENTR
m.	Observe		
	VERB 22	NOUN 01	Flashing
n.	40000		ENTR

+ OG FRICTION TEST

57. Press EXECUTE pushbutton on Programmer and Monitor panel.

57A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 58. Perform steps 59 and 60 during this time.

58. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 58. Perform steps 59 and 60 during this time.

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

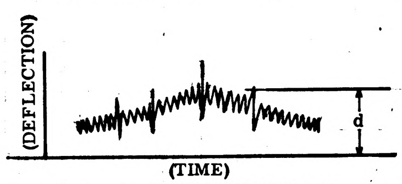
c. CHANNEL 5 to 50 MV/MM.

60. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

61. When Outer Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

62. When Outer Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels 3 and 5. Using equation given in Figure 1, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

MANUAL LOAD PROCEDURES



i = 0.2d Where: 0.2 is Oscillograph sensitivity in volts per centimeter.
d is deflection in centimeters measured from zero reference to midpoint of trace. Ignore any noise spikes.

Figure 1

-IG FRICTION TEST

63. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00407		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

-IG FRICTION TEST

63. Press EXECUTE pushbutton on Programmer and Monitor panel.

63A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

63B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

63C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

63D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

k.	Observe		
	VERB 21	NOUN 01	Flashing
l.	37776		ENTR
m.	Observe		
	VERB 22	NOUN 01	Flashing
n.	37777		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

63E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

63F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

64. Remove jumper from TB1-45 of TPA#2 and connect it to TB2-31 on TPA#2.

65. Remove jumper from TB2-35 of TPA#2 and connect it to TB2-47 on TPA#2.

66. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. IG CDU Fine Error on Channel 1
b. IG TM Current on Channel 4
c. IG CDU Coarse Error on Channel 5.

67. Insure that CH4DC and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted.

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 68. Perform steps 69 and 70 during this time.

68. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 68. Perform steps 69 and 70 during this time.

68. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

69. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

70. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

71. When Inner Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

72. When Inner Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

+IG FRICTION TEST

73. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	VERB 24	NOUN 01	ENTR
j.	00407		ENTR

+IG FRICTION TEST

73. Press EXECUTE pushbutton on Programmer and Monitor panel.

73A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

k.	Observe		
	VERB 21	NOUN 01	Flashing
l.	40001		ENTR
m.	Observe		
	VERB 22	NOUN 01	Flashing
n.	40000		ENTR

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 74. Perform steps 75 and 76 during this time.

74. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

CTS UPLINK TAPE LOAD PROCEDURES

73E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 74. Perform steps 75 and 76 during this time.

74. Press EXECUTE pushbutton on Programmer and Monitor panel.

75. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

76. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

77. When Inner Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

78. When Inner Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels 1 and 5.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

-MG FRICTION TEST	-MG FRICTION TEST
79. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe VERB 23 NOUN 22 Flashing g. +06750 ENTR h. Observe VERB 41 NOUN 22 Displayed i. VERB 24 NOUN 01 ENTR j. 00411 ENTR k. Observe VERB 21 NOUN 01 Flashing l. 14000 ENTR m. Observe VERB 22 NOUN 01 Flashing n. 00000 ENTR	79. Press EXECUTE pushbutton on Programmer and Monitor panel. 79A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 79B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 79C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 79D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 79E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 79F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

80. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall be lighted.

81. Remove the jumper from TB2-31 of TPA#2 and connect it to TB2-32 of TPA#2.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

82. Remove the jumper from TB2-47 of TPA#2 and connect it to TB2-41 of TPA#2.

83. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:
- a. MG CDU Fine Error on Channel 2
- b. MG TM Current on Channel 4
- c. MG CDU Coarse Error on Channel 5.

84. Insure that CH4DC and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NOTE: Middle gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 85. Perform steps 86 and 87 during this time.	NOTE: Middle gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 85. Perform steps 86 and 87 during this time.
85. Perform following DSKY operations: a. VERB 42 ENTR b. VERB 33 ENTR	85. Press EXECUTE pushbutton on Programmer and Monitor panel.

86. Set sensitivities on Oscillograph Amplifiers as follows:
- a. CHANNEL 2 to 5 MV/MM
- b. CHANNEL 4 to 0.2 V/CM
- c. CHANNEL 5 to 50 MV/MM.

87. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

88. When Middle Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

89. When Middle Gimbal indicator appears to stop, in approximately 4 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

+MG FRICTION TEST	+MG FRICTION TEST
90. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe VERB 23 NOUN 22 Flashing g. -06750 ENTR h. Observe VERB 41 NOUN 22 Displayed i. VERB 24 NOUN 01 ENTR j. 00411 ENTR k. Observe VERB 21 NOUN 01 Flashing l. 63777 ENTR m. Observe VERB 22 NOUN 01 Flashing n. 40000 ENTR	90. Press EXECUTE pushbutton on Programmer and Monitor panel 90A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 90B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 90C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 90D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 90E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 90F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

91. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NOTE: Middle gimbal pulse torquing will start approximately 90 seconds	NOTE: Middle gimbal pulse torquing will start approximately 90 seconds

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
after performance of DSKY operations in step 92. Perform steps 93 and 94 during this time.	after pressing EXECUTE pushbutton in step 92. Perform steps 93 and 94 during this time..
92. Perform following DSKY operations: a. VERB 42 ENTR b. VERB 33 ENTR	92. Press EXECUTE pushbutton on Programmer and Monitor panel.

93. Set sensitivities on Oscillograph Amplifiers as follows:
- a. CHANNEL 2 to 5 MV/MM
- b. CHANNEL 4 to 0.2 V/CM
- c. CHANNEL 5 to 50 MV/MM.

94. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

95. When Middle Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

96. When Middle Gimbal indicator appears to stop, in approximately 4 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record the maximum amplitude (neglect spikes) of Channels 2 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

97. Remove all jumper cables installed during this procedure.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
98. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe VERB 23 NOUN 22 Flashing g. +00000 ENTR h. Observe VERB 41 NOUN 22 Displayed	98. Press EXECUTE pushbutton on Programmer and Monitor panel. 98A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 98B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 98C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. Observe that VERB 41 NOUN 22 are displayed on DSKY.

IG STEP RESPONSE

99. Set CHANNEL 1, 2, and 3 switches on Oscillograph Signal Selector panel to 2 to monitor following signals:
  a. IG&Y Gyro error signal on Channel 1
  b. MG error signal on Channel 2
  c. OG error signal on Channel 3.

100. Insure that CH3AC pushbutton on Oscillograph Signal Selector panel is lighted.

101. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set sensitivities on Oscillograph Amplifiers as follows:
  a. CHANNEL 1 to 50 MV/MM
  b. CHANNEL 2 to 10 MV/MM
  c. CHANNEL 3 to 10 MV/MM.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

102. Set PHASE SHIFT SELECTOR on Phase Sensitive Demodulators of CHANNELS 1, 2, and 3 to 3200 ~ 0 DEG and set FILTER switches to HI.

103. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 and TB2-11 on TPA#2.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
104. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe VERB 23 NOUN 22 Flashing g. +00000 ENTR h. Observe VERB 41 NOUN 22 Displayed i. Wait 60 seconds j. VERB 36 ENTR	104. Press EXECUTE pushbutton on Programmer and Monitor panel. 104A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 104B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 104C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 104D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

105. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

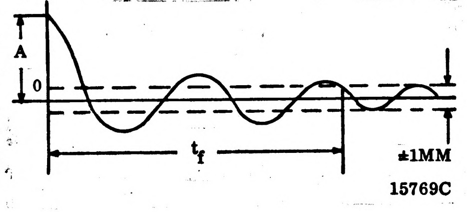

Figure 2

106. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

107. After observing a constant servo error on Channel 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

108. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

MG STEP RESPONSE

109. Set sensitivities on Oscillograph Amplifiers as follows:
  a. CHANNEL 1 to 10 MV/MM
  b. CHANNEL 2 to 20 MV/MM
  c. CHANNEL 3 to 10 MV/MM.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

110. Apply the 5V step input to the MG TDA test input by removing the jumper connected in step 103 and connecting it between TB5-18 and TB2-10 on TPA#2.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
111. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe VERB 23 NOUN 22 Flashing g. +00000 ENTR h. Observe VERB 41 NOUN 22 Displayed i. Wait 60 seconds j. VERB 36 ENTR	111. Press EXECUTE pushbutton on Programmer and Monitor panel. 111A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 111B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 111C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 111D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

112. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

113. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

114. After observing a constant servo error on Channel 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

115. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

116. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 20 MV/MM.

117. Connect the 5V step input to the OG TDA test input by removing the jumper connected in step 110 and connecting it between TB5-18 and TB2-4 on TPA#2.

118. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR	
b. Observe			
VERB 21	NOUN 22	Flashing	
c. +00000	ENTR		
d. Observe			
VERB 22	NOUN 22	Flashing	
e. +00000		ENTR	
f. Observe			
VERB 23	NOUN 22	Flashing	
g. +00000		ENTR	
h. Observe			
VERB 41	NOUN 22	Displayed	
i. Wait 60 seconds			
j. VERB 36		ENTR	

118. Press EXECUTE pushbutton on Programmer and Monitor panel.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

119. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

120. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

121. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

122. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value. Remove jumper connected in step 117.

NORMALIZATION OF SYSTEM

123. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 41	NOUN 20	ENTR
c. Observe		
VERB 21	NOUN 22	Flashing
d. +00000		ENTR
e. Observe		
VERB 22	NOUN 22	Flashing

NORMALIZATION OF SYSTEM

123. Press EXECUTE pushbutton on Programmer and Monitor panel.

123A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

123B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

f. +00000		ENTR
g. Observe		
VERB 23	NOUN 22	Flashing
h. +00000		ENTR

123C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

124. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

125. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

126. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press to light MONITOR pushbutton. AGC INPUT-CTR pushbutton shall go out.

127. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

128. Press to extinguish SELF TEST pushbutton on Self Test panel.

129. Remove Self Test Assembly from Buffer Box Assembly. Connect cable W226 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12220
REV J
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME / AFFILIATION APPROVED BY ______ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC IMU Operate Bus A	vdc	28.3		29.3		
9	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
15	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
17	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
19	IG error phase shift	deg	▨		▨		
21	IG error in-phase null	mv	-60		+60		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12220
REV. J

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
27	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
29	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
31	MG error phase shift	deg	▨		▨		
33	MG error in-phase null	mv	-60		+60		
39	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
41	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
43	OG error phase shift	deg	▨		▨		
45	OG error in-phase null	mv	-60		+60		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12220
REV. J

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
46	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
55	Gyro PVR output voltage	vdc	▨		▨		
62	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	amps	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
78	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	amps	-0.125		+0.125		
	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
96	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	amps	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
108	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12220
REV. J

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
115	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
122	Oscillation peaks	▨	▨		5		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
	AGC Displays	All DSKY displays and indications reacted as specified.					

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JOB GIMBAL RESPONSE TEST

JDC 12220 **REV.** K **PAGE** 1 **OF** 27

INITIAL TDRR 29882 **D.S. PGS** 4

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor currents are monitored on the Oscillograph. After the gimbal friction test, the OG, MG, and IG stabilization loop responses are tested by providing a step input to each DC stabilization amplifier.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	1-12-67	32623	2	1	EA	-
B	2-2-67	32886	All	All	EA	-
C	6-6-67	33907	10	-	EA	-
D	1-15-68	35427	1-4, 6, 8, 9	All	EA	-
E	1-17-68	35457	2-10	All	EA	-
F	2-29-68	35773	1, 2	2	EA	-
G	10-21-68	36927	1	-	EA	-
H	11-12-68	37019	All	All	EA	-
J	12-3-68	37083	2, 27	-	EA	-
K	3-11-69	37408	27	-	EA	-

REFERENCES

PS-2015000

IMPORTANT

See below

INTERVAL

TOOLS AND MATERIAL

See appropriate section of JDC

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector before proceeding.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM 0143A
Clg 3-15-66

JOB GIMBAL RESPONSE TEST

JDC 12220 **REV** K **PAGE** 2 **OF** 27

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12220 CTS UPLINK Tape P/N 2901650 -001

NOTE: Prepare the CGC for the UPLINK code by establishing the following conditions on the CTS:

a. Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

b. Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

c. Set digitswitches on Self Test Assembly to 00000.

d. Self Test Panel -
Press to light SELF TEST pushbutton.

e. Tape Reader -
Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

f. Programmer and Monitor panel -
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

g. RDC Interface panel -
Press to light CH33-10 pushbutton.

h. XY Interface panel -
Press to light POSITIVE, NEGATIVE,

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JOB GIMBAL RESPONSE TEST

JDC 12220 **REV** K **PAGE** 3 **OF** 27

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

i. Programmer and Monitor panel -
Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition.

2. Connect 28 VDC IMU Operate Bus A to Digital Voltmeter (DVM) by setting CROSSBAR CONTROL on Primary Signal Selector panel to 173.

3. Measure and record bus voltage. If necessary, adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc.

4. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR
k.	VERB 40	NOUN 20	ENTR

4. Press EXECUTE pushbutton on Programmer and Monitor panel.

4A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

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JOB GIMBAL RESPONSE TEST

JDC 12220 **REV** K **PAGE** 4 **OF** 27

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

5. Perform following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	00362		ENTR
c.	16002		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

STATIC LOOP PARAMETERS

6. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

7. Set REFERENCE switch to 4.

8. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

12. Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and press to light GIMBAL SERVO TEST pushbutton.

13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

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MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

14. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

18. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

19. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

20. Set PAVM to the phase angle value recorded in step 19.

21. Measure and record the voltage indicated on PAVM as the IG error in-phase null.

22. Connect MG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

23. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.

24. Set GIMBAL SERVO TEST switch on Test Selector panel to 2.

25. Apply square wave input to MG loop by pressing TEST START pushbutton on Test Selector panel.

26. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°).

27. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

28. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

29. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

30. Remove input from MG loop by pressing TEST STOP pushbutton on Test Selector panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

31. Calculate the average of the values obtained in steps 27 and 29. Subtract the value recorded in step 9 from the average and record result.

32. Set PAVM to the phase angle value recorded in step 31.

33. Measure and record the voltage indicated on PAVM as the MG error in-phase null.

34. Connect OG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.

35. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.

36. Set GIMBAL SERVO TEST switch on Test Selector panel to 3.

37. Apply square wave input to OG loop by pressing TEST START pushbutton on Test Selector panel.

38. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

39. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

40. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph

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MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions on the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

41. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

42. Remove input from OG loop by pressing TEST STOP pushbutton on Test Selector panel.

43. Calculate the average of the values obtained in steps 39 and 41. Subtract the value recorded in step 9 from the average and record result.

44. Set PAVM to the phase angle value recorded in step 43.

45. Measure and record the voltage indicated on PAVM as the OG error in-phase null.

46. Set CROSSBAR CONTROL on Primary Signal Selector panel to following positions to monitor the corresponding voltages. Record the total voltage value of each:

	CROSSBAR CONTROL	Voltage
a.	136	OG TDA
b.	137	MG TDA
c.	138	IG TDA

-OG FRICTION TEST

47. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR

-OG FRICTION TEST

47. Press EXECUTE pushbutton on Programmer and Monitor panel.

47A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe
VERB 21 NOUN 01 Flashing
l. 37776 ENTR
m. Observe
VERB 22 NOUN 01 Flashing
n. 37777 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

47B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

47F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

48. Connect jumpers between following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45(hi) TB1-49(lo)
TPA#2	BUFFERED PROBE	TB2-35(hi) TB2-18(lo)

49. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:
a. OG CDU Fine Error on Channel 3

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

b. OG TM Current on Channel 4
c. OG CDU Coarse Error on Channel 5.

50. Insure that CH3AC, CH4DC, and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted. Insure that PHASE SHIFT SELECTOR switches on Oscillograph Phase Sensitive Demodulators for Channels 1, 2, 3, and 5 are set to 800 ~ 0 DEG and FILTER switches are set to LO.

51. Connect P2 of W65 to J15 on TPA#2 and set IRIG SCALE FACTOR switch on TPA#2 to 1.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 52. Perform steps 53 and 54 during this time.

52. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 52. Perform steps 53 and 54 during this time.

52. Press EXECUTE pushbutton on Programmer and Monitor panel.

53. Set sensitivities on Oscillograph Amplifiers as follows:
a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

54. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

55. When Outer Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph

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MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

Control panel to MM/SEC and measure and record the GYRO PVR output on Current Source Monitor panel per JDC 18216.

56. When Outer Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

+ OG FRICTION TEST

57. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe
VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe
VERB 22 NOUN 01 Flashing
n. 40000 ENTR

+ OG FRICTION TEST

57. Press EXECUTE pushbutton on Programmer and Monitor panel.

57A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

57F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 58. Perform steps 59 and 60 during this time.

58. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 58. Perform steps 59 and 60 during this time.

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

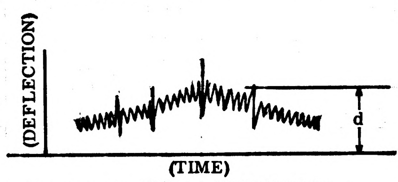
59. Set sensitivities on Oscillograph Amplifiers as follows:
a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

60. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

61. When Outer Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

62. When Outer Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels 3 and 5. Using equation given in Figure 1, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES



i = 0.2d Where: 0.2 is Oscillograph sensitivity in volts per centimeter.
d is deflection in centimeters measured from zero reference to midpoint of trace. Ignore any noise spikes.

Figure 1

-IG FRICTION TEST

63. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR

-IG FRICTION TEST

63. Press EXECUTE pushbutton on Programmer and Monitor panel.

63A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

63B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

63C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

63D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

k. Observe
VERB 21 NOUN 01 Flashing
l. 37776 ENTR
m. Observe
VERB 22 NOUN 01 Flashing
n. 37777 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

63E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

63F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

64. Remove jumper from TB1-45 of TPA#2 and connect it to TB2-31 on TPA#2.

65. Remove jumper from TB2-35 of TPA#2 and connect it to TB2-47 on TPA#2.

66. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:
a. IG CDU Fine Error on Channel 1
b. IG TM Current on Channel 4
c. IG CDU Coarse Error on Channel 5.

67. Insure that CH4DC and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted.

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 68. Perform steps 69 and 70 during this time.

68. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 68. Perform steps 69 and 70 during this time.

68. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

69. Set sensitivities on Oscillograph Amplifiers as follows:
a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

70. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

71. When Inner Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

72. When Inner Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

+IG FRICTION TEST

73. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR

+IG FRICTION TEST

73. Press EXECUTE pushbutton on Programmer and Monitor panel.

73A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

k. Observe
VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe
VERB 22 NOUN 01 Flashing
n. 40000 ENTR

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 74. Perform steps 75 and 76 during this time.

74. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

73E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Inner Gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 74. Perform steps 75 and 76 during this time.

74. Press EXECUTE pushbutton on Programmer and Monitor panel.

75. Set sensitivities on Oscillograph Amplifiers as follows:
a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

76. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

77. When Inner Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

78. When Inner Gimbal indicator appears to stop, in approximately 11 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels 1 and 5.

Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

79. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +06750 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00411 ENTR
k. Observe
VERB 21 NOUN 01 Flashing
l. 14000 ENTR
m. Observe
VERB 22 NOUN 01 Flashing
n. 00000 ENTR

-MG FRICTION TEST

79. Press EXECUTE pushbutton on Programmer and Monitor panel.

79A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

79B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

79C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

79D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

79E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

79F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

80. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall be lighted.

81. Remove the jumper from TB2-31 of TPA#2 and connect it to TB2-32 of TPA#2.

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82. Remove the jumper from TB2-47 of TPA#2 and connect it to TB2-41 of TPA#2.

83. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. MG CDU Fine Error on Channel 2
b. MG TM Current on Channel 4
c. MG CDU Coarse Error on Channel 5.

84. Insure that CH4DC and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted.

NOTE: Middle gimbal pulse torquing will start approximately 90 seconds after performance of DSKY operations in step 85. Perform steps 86 and 87 during this time.

85. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Middle gimbal pulse torquing will start approximately 90 seconds after pressing EXECUTE pushbutton in step 85. Perform steps 86 and 87 during this time.

85. Press EXECUTE pushbutton on Programmer and Monitor panel.

86. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

87. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

88. When Middle Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

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89. When Middle Gimbal indicator appears to stop, in approximately 4 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

+MG FRICTION TEST

90. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. -06750 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00411 ENTR
k. Observe
VERB 21 NOUN 01 Flashing
l. 63777 ENTR
m. Observe
VERB 22 NOUN 01 Flashing
n. 40000 ENTR

+MG FRICTION TEST

90. Press EXECUTE pushbutton on Programmer and Monitor panel

90A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

90B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

90C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

90D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

90E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

90F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

91. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

NOTE: Middle gimbal pulse torquing will start approximately 90 seconds

NOTE: Middle gimbal pulse torquing will start approximately 90 seconds

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after performance of DSKY operations in step 92. Perform steps 93 and 94 during this time.

92. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

after pressing EXECUTE pushbutton in step 92. Perform steps 93 and 94 during this time.

92. Press EXECUTE pushbutton on Programmer and Monitor panel.

93. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

94. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

95. When Middle Gimbal indicator on Gimbal Position Control panel starts to move, set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

96. When Middle Gimbal indicator appears to stop, in approximately 4 minutes, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record the maximum amplitude (neglect spikes) of Channels 2 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

97. Remove all jumper cables installed during this procedure.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
98. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe VERB 23 NOUN 22 Flashing g. +00000 ENTR h. Observe VERB 41 NOUN 22 Displayed	98. Press EXECUTE pushbutton on Programmer and Monitor panel. 98A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 98B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 98C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. Observe that VERB 41 NOUN 22 are displayed on DSKY.

IG STEP RESPONSE

99. Set CHANNEL 1, 2, and 3 switches on Oscillograph Signal Selector panel to 2 to monitor following signals:

a. IG&Y Gyro error signal on Channel 1
b. MG error signal on Channel 2
c. OG error signal on Channel 3.

100. Insure that CH3AC pushbutton on Oscillograph Signal Selector panel is lighted.

101. Press CHART SPEEDS 100 pushbutton on Oscillograph Control panel and set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 50 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 10 MV/MM.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

102. Set PHASE SHIFT SELECTOR on Phase Sensitive Demodulators of CHANNELS 1, 2, and 3 to 3200 ~ 0 DEG and set FILTER switches to HI.

103. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 and TB2-11 on TPA#2.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
104. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe VERB 23 NOUN 22 Flashing g. +00000 ENTR h. Observe VERB 41 NOUN 22 Displayed i. Wait 60 seconds j. VERB 36 ENTR	104. Press EXECUTE pushbutton on Programmer and Monitor panel. 104A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 104B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 104C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 104D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

105. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

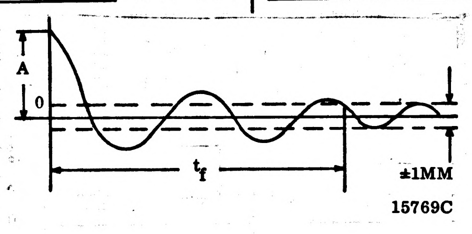

Figure 2

106. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

107. After observing a constant servo error on Channel 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

108. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

MG STEP RESPONSE

109. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 20 MV/MM
c. CHANNEL 3 to 10 MV/MM.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

110. Apply the 5V step input to the MG TDA test input by removing the jumper connected in step 103 and connecting it between TB5-18 and TB2-10 on TPA#2.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
111. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe VERB 23 NOUN 22 Flashing g. +00000 ENTR h. Observe VERB 41 NOUN 22 Displayed i. Wait 60 seconds j. VERB 36 ENTR	111. Press EXECUTE pushbutton on Programmer and Monitor panel. 111A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 111B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 111C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 111D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

112. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

113. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

114. After observing a constant servo error on Channel 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

115. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

116. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 10 MV/MM

b. CHANNEL 2 to 10 MV/MM

c. CHANNEL 3 to 20 MV/MM.

117. Connect the 5V step input to the OG TDA test input by removing the jumper connected in step 110 and connecting it between TB5-18 and TB2-4 on TPA#2.

118. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000	ENTR	
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe		
	VERB 41	NOUN 22	Displayed
i.	Wait 60 seconds		
j.	VERB 36		ENTR

118. Press EXECUTE pushbutton on Programmer and Monitor panel.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118D. Wait 60 seconds after VERB 41 NOUN 22 are displayed on DSKY and then press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

119. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

120. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

121. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

122. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value. Remove jumper connected in step 117.

NORMALIZATION OF SYSTEM

123. Perform following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	Observe		
	VERB 21	NOUN 22	Flashing
d.	+00000		ENTR
e.	Observe		
	VERB 22	NOUN 22	Flashing

NORMALIZATION OF SYSTEM

123. Press EXECUTE pushbutton on Programmer and Monitor panel.

123A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

123B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

f.	+00000		ENTR
g.	Observe		
	VERB 23	NOUN 22	Flashing
h.	+00000		ENTR

123C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

124. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

125. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

126. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press to light MONITOR pushbutton. AGC INPUT-CTR pushbutton shall go out.

127. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

128. Press to extinguish SELF TEST pushbutton on Self Test panel.

129. Remove Self Test Assembly from Buffer Box Assembly.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC
NO. 12220
REV K
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END. ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC IMU Operate Bus A	vdc	28.3		29.3		
9	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
15	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
17	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
19	IG error phase shift	deg	▨		▨		
21	IG error in-phase null	mv	-60		+60		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC
NO. 12220
REV. K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
27	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
29	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
31	MG error phase shift	deg	▨		▨		
33	MG error in-phase null	mv	-60		+60		
39	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
41	PHASE GENERATOR 3200 CPS readout	deg	▨		▨		
43	OG error phase shift	deg	▨		▨		
45	OG error in-phase null	mv	-60		+60		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC
NO. 12220
REV. K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
46	Total OG TDA	volts	▨		10		
	Total MG TDA	volts	▨		10		
	Total IG TDA	volts	▨		10		
55	Gyro PVR output voltage	vdc	▨		▨		
62	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	amps	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
78	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	amps	-0.125		+0.125		
	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
96	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	amps	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
108	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC
NO. 12220
REV. K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
115	Oscillation peaks	▨	▨		3		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
122	Oscillation peaks	▨	▨		5		
	Magnitude A	mm	▨		▨	▨	▨
	t_f	ms	▨		100		
	AGC Displays	All DSKY displays and indications reacted as specified.					

DATE 30 JUN 66

JOB GIMBAL RESPONSE TEST

JDC 12220 REV. - PAGE 1 OF 9

INITIAL TDRR 29882 D.S. PGS 2

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored (continued below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES PS-2015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (cont) on the Oscillograph. After the gimbal friction test, the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

IMPORTANT: 1. All starred (**) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.

2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.

INITIALIZATION

1. Establish a MASTER INITIALIZATION condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector to panel to 220.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE __________

JOB GIMBAL RESPONSE TEST

JDC 12220 REV - PAGE 2 OF 9

SUBSYSTEM G & N SYSTEM

ASSY

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe VERB 41 NOUN 22 Displayed

i. Wait 60 seconds

j. VERB 36 ENTR

k. VERB 40 NOUN 20 ENTR

STATIC LOOP PARAMETERS

5. Set the Primary Signal Selector panel to monitor the following signals on PAVM. Record the in-phase voltage for each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG error Signal	134
c. IG Error Signal	135

6. Set the Primary Signal Selector panel to monitor the following signals on the Oscilloscope. Record the peak-to-peak indication for each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

7. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00405 ENTR

k. Observe VERB 21 NOUN 01 Flashing

l. 37776 ENTR

m. Observe VERB 22 NOUN 01 Flashing

n. 37777 ENTR

8. Place jumpers between the following points:

GSE	From	To
A1P	DIRECT PROBES OUTPUT	CH4DC
A1P	BUFFERED PROBES OUTPUT	CH5AC
TPA#2	DIRECT PROBE	TB1-45 (hi) 49(lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18(lo)

9. Set CHANNEL 3 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3

b. OG TM current on CHANNEL 4

c. OG CDU Coarse Error on CHANNEL 5.

10. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

DATE __________

JOB GIMBAL RESPONSE TEST

JDC 12220 REV - PAGE 3 OF 9

SUBSYSTEM G & N SYSTEM

ASSY

11. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM

b. CHANNEL 4 to 50 MV/MM

c. CHANNEL 5 to 10 MV/MM

12. Connect P2 of W65 to J15 on TPA #2 and set the IRIG SCALE FACTOR switch on the TPA #2 to 1.

13. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

14. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC and measure and record the GYRO PVR output on the Current Source Monitor panel per JDC 18016.

15. When the Outer Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00405 ENTR

k. Observe VERB 21 NOUN 01 Flashing

l. 40001 ENTR

m. Observe VERB 22 NOUN 01 Flashing

n. 40000 ENTR

17. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 10 MV/MM

b. CHANNEL 4 to 50 MV/MM

c. CHANNEL 5 to 10 MV/MM

18. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Outer Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

19. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

DATE __________

JOB GIMBAL RESPONSE TEST

JDC 12220 REV - PAGE 4 OF 9

SUBSYSTEM G & N SYSTEM

ASSY

When the Outer Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

20. When the Outer Gimbal indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

21. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00407 ENTR

k. Observe VERB 21 NOUN 01 Flashing

m. 37776 ENTR

n. Observe VERB 22 NOUN 01 Flashing

o. 37777 ENTR

22. Remove the jumper from TB1-45 of TPA #2 and place it on TB2-31 of TPA #2.

23. Remove the jumper from TB2-35 of TPA #2 and place it on TB2-47 of TPA #2.

24. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1

b. IG TM Current on CHANNEL 4

c. IG CDU Coarse Error on CHANNEL 5.

25. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

26. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to .1 V/CM

c. CHANNEL 5 to 50 MV/MM

27. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

28. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

DATE __________

JOB GIMBAL RESPONSE TEST | JDC 12220 REV | PAGE 5 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

29. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

30. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 40001 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

32. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Inner Gimbal Pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

33. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Inner Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

34. When the Inner Gimbal Indicator appears to stop, in approximately 11 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

-MG FRICTION TEST

35. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing

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JOB GIMBAL RESPONSE TEST | JDC 12220 REV | PAGE 6 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

g. +06750 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00411 ENTR
k. Observe VERB 21 NOUN 01 Flashing
l. 14000 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 00000 ENTR

36. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

37. Remove the jumper from TB2-31 of TPA #2 and place it on TB2-32 of TPA #2.

38. Remove the jumper from TB2-47 of TPA #2 and place it on TB2-41 of TPA #2.

39. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5

40. Insure that the CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

41. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

42. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

43. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

44. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

45. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. -06750 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00411 ENTR

DATE ________

JOB GIMBAL RESPONSE TEST | JDC 12220 REV | PAGE 7 OF 9
SUBSYSTEM G & N SYSTEM | ASSY

k. Observe VERB 21 NOUN 01 Flashing
l. 63777 ENTR
m. Observe VERB 22 NOUN 01 Flashing
n. 40000 ENTR

46. The GIMBAL LOCK CAUTION lamp on the Monitor panel shall light.

47. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to .1 V/CM
c. CHANNEL 5 to 50 MV/MM

48. Set the chart speed to 1 on the Oscillograph Control panel.

NOTE: Middle Gimbal pulse torquing will start approximately 90 seconds after performance of the DSKY operations in the following step.

49. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

When the Middle Gimbal indicator on the Gimbal Position Control panel starts to move, set the CHART DRIVE switch on the Oscillograph Control panel to MM/SEC.

50. When the Middle Gimbal Indicator appears to stop, in approximately 4 minutes, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

51. Remove all jumper cables placed during this procedure.

52. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed

IG STEP RESPONSE

53. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

54. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lighted.

55. Press the CHART SPEEDS 100 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

a. CHANNEL 1 to 50 MV/MM

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JOB GIMBAL RESPONSE TEST | JDC 12220 REV | PAGE 8 OF 9
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b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 10 MV/MM

56. Set the PHASE SHIFT SELECTOR on the phase sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200~ 0 deg.

57. Connect a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

58. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

59. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

60. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

61. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

62. Record the IG stabilization loop response time on CHANNEL 1 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

MG STEP RESPONSE

63. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 50 MV/MM
c. CHANNEL 3 to 10 MV/MM

64. Remove the jumper of step 57 and connect between TB5-18 of TPA #2 and TB2-10 of TPA #2.

65. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

66. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

67. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

68. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

DATE ________

JOB GIMBAL RESPONSE TEST | JDC 12220 REV | PAGE 9 OF 9

SUBSYSTEM G & N SYSTEM | ASSY

69. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

OG STEP RESPONSE

70. Set the sensitivities on the Oscillograph Amplifier panel as follows:

a. CHANNEL 1 to 10 MV/MM
b. CHANNEL 2 to 10 MV/MM
c. CHANNEL 3 to 50 MV/MM

71. Remove the jumper of step 64 and connect between TB5-18 of TPA #2 and TB2-4 of TPA #2.

72. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 41 NOUN 22 Displayed
i. Wait 60 seconds
j. VERB 36 ENTR

73. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

74. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

75. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch and stop the Oscillograph.

76. Record the OG stabilization loop response time on CHANNEL 3 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance. Remove jumpers connected in step 71.

NORMALIZATION OF SYSTEM

77. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe VERB 23 NOUN 23 Flashing
h. +00000 ENTR

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12220
REV. -
INITIAL TDRR 29882

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY
DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ________ ________ CAL DATE
NAME ________ SER. NO. ________ ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.50		28.50		
5.a	OG Error signal**	mv	0		60		
5.b	MG Error signal**	mv	0		60		
5.c	IG Error signal**	mv	0		60		
6	OG TDA	v p-p	▨		20		
	MG TDA	v p-p	▨		20		
	IG TDA	v p-p	▨		20		
14	Gyro PVR output voltage	vdc	5.94		6.06		
20	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
	OG TM Current on CH4	vdc	-0.125		+0.125		
	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
	IG TM Current on CH4	vdc	-0.125		+0.125		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12220
REV. -

JOB ________

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34 (cont)	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
50	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
	MG TM Current on CH4	vdc	-0.125		+0.125		
	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
62	IG Stabilization loop response	sec	0		0.8		
	Number of overshoots	number	0		2		
69	MG stabilization loop response	sec	0		0.8		
	Number of overshoots	number	0		2		
76	OG stabilization loop response	sec	0		0.8		
	Number of overshoots	number	0		2		
	AGC Displays	All DSKY displays and indications reacted as specified.					

DATE ________

JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV. A PAGE 1 OF 8
INITIAL TDRR 29882 D.S. PGS. 7

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30310	All	2,4	EA	WS

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Establish a Master Initialization Condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes to TB 4-43 (Hi) and 4-47 (Lo) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 199.

ATTITUDE ERROR (FDAI) TEST

4. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00013 ENTR
c. Observe
VERB 33 NOUN 01 Flashing
d. Observe
PROG lamp indicates 07
e. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

5. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

6. Press the ENTR pushbutton and

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Row 3 displays +00384

Record the voltage indication and sign.

7. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160
d. Row 3 displays +00160

Record the voltage indication and sign.

8. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135
d. Row 3 displays +00135

Record the voltage indication and sign.
Determine and record the phase angle of signal.

9. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090
d. Row 3 displays +00090

Record the voltage indication and sign.

10. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000
d. Row 3 displays -00090

Record the voltage indication and sign.

11. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090
d. Row 3 displays -00135

Record the voltage indication and sign.

12. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135
d. Row 3 displays -00160

Record the voltage indication and sign.

13. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays -00160

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c. Row 2 displays +00160
d. Row 3 displays -00384

Record the voltage indication and sign.

14. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384
d. Row 3 displays -00385

Record the voltage indication and sign.

15. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 01 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385
d. Row 3 displays +00000

Record the voltage indication and sign.

16. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

17. Connect the Direct Probes to TB4-34 (Hi) and 4-38 (Lo) on TPA #2 to monitor the Roll CDU DC D/A output.

18. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

19. Press the ENTR pushbutton and observe the DSKY displays the following:

a. VERB 33 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

20. Press the ENTR pushbutton and observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

21. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 33 NOUN 02 Flashing
c. Observe
Row 1 displays +00385
d. Observe
Row 2 displays -00385
e. Observe
Row 3 displays +00385
f. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

22. Repeat steps 6 through 15 measuring the voltages on the DVM rather than PAVM. Note that VERB 33 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

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23. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 03 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

YAW TVC MONITOR

24. Connect the Direct Probes to TB 4-29 (Hi) and 4-33 (Lo) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

25. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

26. Set the OPTICS MODE selector on the Indicator Control panel to MAN.

27. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 01 NOUN 10 Flashing
b. Row 1 displays X7373
c. Row 3 displays 00030

28. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 01 NOUN 10 Flashing
c. Observe
Row 1 displays 37777
d. Observe
Row 3 displays 00031

29. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 33 NOUN 03 Flashing
c. Observe
Row 1 displays +00385
d. Observe
Row 2 displays -00385
e. Observe
Row 3 displays +00003

Record the voltage indication and sign.

NOTE: Row 3 shall display +00003 until completion of step 39.

30. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe
VERB 33 NOUN 03 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

31. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 03 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160

Record the voltage and sign indications on the DVM.

32. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 03 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135

Record the voltage indication and sign.

33. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 03 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090

Record the voltage indication and sign. Set the OPTICS CONTROLLER SPEED switch on the Indicator Control panel to HI.

34. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 03 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000

While holding the Optics Hand Controller up and left (45°) no longer than 10 seconds, record the voltage indication and sign.

35. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 03 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090

Record the voltage indication and sign. Set the OPTICS MODE switch to ZERO for 30 seconds, then return to MAN.

36. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 03 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135

Record the voltage indication and sign.

37. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 03 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160

Record the voltage indicator and sign.

38. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 03 Flashing

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b. Row 1 displays -00384
c. Row 2 displays +00384

Record the voltage indication and sign.

39. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 03 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385

Record the voltage indication and sign.

TEST ABORT AND RESTART

40. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe PROG lamp indicates 00
c. VERB 57 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 00013 ENTR
f. Observe VERB 33 NOUN 01 Flashing
g. Observe NO ATT lamp lights
h. Observe PROG lamp indicates 07

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

41. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall not be lighted.

PITCH (IG) CDU AC D/A MONITOR

42. Connect the Buffered Probes to TB 4-45 (Hi) and 4-49 (Lo) on TPA #2 to monitor the Pitch CDU AC Att Error.

43. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 99.

ATTITUDE ERROR (FDAI) TEST

44. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

PITCH (IG) CDU DC D/A MONITOR

45. Connect the Direct Probes to TB 4-36 (Hi) and 4-40 (Lo) on TPA #2 to monitor the Pitch CDU DC D/A output.

46. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

47. Press the ENTR pushbutton and observe the DSKY displays the following:

a. VERB 33 NOUN 02 Flashing
b. Observe NO ATT lamp lights

48. Enter VERB 33 and press the ENTR pushbutton and observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

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49. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe VERB 33 NOUN 02 Flashing
c. Observe NO ATT lamp goes out
d. Observe Row 1 displays +00385
e. Observe Row 2 displays -00385
f. Observe Row 3 displays +00385

Record the voltage and sign indications on the DVM.

50. Repeat steps 6 through 15 measuring the voltages on DVM rather than PAVM. Note that VERB 33 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

51. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 03 Flashing
b. Observe NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

PITCH TVC MONITOR

52. Connect the Direct Probes to TB 4-28 (Hi) and 4-32 (Lo) on TPA #2 to monitor the Pitch TVC output.

TVC TEST

53. Repeat steps 26 through 41.

YAW (MG) CDU AC D/A MONITOR

54. Connect the Buffered Probes to TB 4-44 (Hi) and 4-48 (Lo) on TPA #2 to monitor the Yaw CDU AC Att Error.

55. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99.

ATTITUDE ERROR (FDAI) TEST

56. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

YAW (MG) CDU C/A MONITOR

57. Connect the Direct Probes to TB 4-35 (Hi) and 4-39 (Lo) on TPA #2 to monitor the Yaw CDU DC D/A output.

58. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

59. Press the ENTR pushbutton and observe the DSKY displays the following:

a. Observe VERB 33 NOUN 02 Flashing
b. Observe NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

60. Press the ENTR pushbutton and observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

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61. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe VERB 33 NOUN 02 Flashing
c. Observe NO ATT lamp goes out
d. Observe Row 1 displays +00385
e. Observe Row 2 displays -00385
f. Observe Row 3 displays +00385

Record the voltage indication and sign.

62. Repeat steps 6 through 15 measuring the voltage on DVM rather than PAVM. Note that VERB 33 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurements in step 8.

TEST ABORT

63. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall not be lighted.

64. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe NO ATT lamp is not lighted.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12221
REV. A
INITIAL TDRR 29882

JOB SPACECRAFT CONTROL AND DISPLAY TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	Roll Att Error +00385	vac	+4.57		+5.57		
6	Roll Att Error +00384	vac	+4.56		+5.56		
7	Roll Att Error +00160	vac	+1.90		+2.32		
8	Roll Att Error +00135	vac	+1.60		+1.96		
	Roll Att Error Phase Angle	deg	-8.0		+8.0		
9	Roll Att Error +00090	vac	+1.07		+1.31		
10	Roll Att Error +00000	vac	-0.056		+0.056		
11	Roll Att Error -00090	vac	-1.07		-1.31		
12	Roll Att Error -00135	vac	-1.60		-1.96		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12221
REV. A

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	Roll Att Error -00160	vac	-1.90		-2.32		
14	Roll Att Error -00384	vac	-4.56		-5.56		
15	Roll Att Error -00385	vac	-4.57		-5.57		
21	Roll S/C - Saturn +00385	vdc	+4.70		+5.44		
22 (6)	Roll S/C - Saturn +00384	vdc	+4.70		+5.43		
22 (7)	Roll S/C - Saturn +00160	vdc	+1.98		+2.24		
22 (8)	Roll S/C - Saturn +00135	vdc	+1.67		+1.89		
22 (9)	Roll S/C - Saturn +00090	vdc	+1.12		+1.26		
22 (10)	Roll S/C - Saturn +00000	vdc	-0.011		+0.01		
22 (11)	Roll S/C - Saturn -00090	vdc	-1.12		-1.26		
22 (12)	Roll S/C - Saturn -00135	vdc	-1.67		-1.89		
22 (13)	Roll S/C - Saturn -00160	vdc	-1.98		-2.24		
22 (14)	Roll S/C - Saturn -00384	vdc	-4.70		-5.43		
22 (15)	Roll S/C - Saturn -00385	vdc	-4.70		-5.44		

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EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12221
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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29	Yaw TVC +00385	vdc	+4.70		+5.44		
30	Yaw TVC +00384	vdc	+4.70		+5.44		
31	Yaw TVC +00160	vdc	+1.98		+2.24		
32	Yaw TVC +00135	vdc	+1.67		+1.89		
33	Yaw TVC +00090	vdc	+1.12		+1.26		
34	Yaw TVC +00000	vdc	-0.01		+0.01		
35	Yaw TVC -00090	vdc	-1.12		-1.26		
36	Yaw TVC -000135	vdc	-1.67		-1.89		
37	Yaw TVC -00160	vdc	-1.98		-2.24		
38	Yaw TVC -00384	vdc	-4.70		-5.43		
39	Yaw TVC -00385	vdc	-4.70		-5.44		
44 (5)	Pitch Att Error -00385	vac	-4.57		-5.57		
44 (6)	Pitch Att Error -00384	vac	-4.56		-5.56		
44 (7)	Pitch Att Error -00160	vac	-1.90		-2.32		

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EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12221
REV. A

JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
44 (8)	Pitch Att Error -00135	vac	-1.60		-1.96		
	Pitch Att Error Phase Angle	deg	+172.0		+188.0		
44 (9)	Pitch Att Error -00090	vac	-1.07		-1.31		
44 (10)	Pitch Att Error +00000	vac	-0.056		+0.056		
44 (11)	Pitch Att Error +00090	vac	+1.07		+1.31		
44 (12)	Pitch Att Error +00135	vac	+1.60		+1.96		
44 (13)	Pitch Att Error +00160	vac	+1.90		+2.32		
44 (14)	Pitch Att Error +00384	vac	+4.56		+5.56		
44 (15)	Pitch Att Error +00385	vac	+4.57		+5.57		
49	Pitch S/C - Saturn -00385	vdc	-4.70		-5.44		
50 (6)	Pitch S/C - Saturn -00384	vdc	-4.70		-5.43		
50 (7)	Pitch S/C - Saturn -00160	vdc	-1.98		-2.24		
50 (8)	Pitch S/C - Saturn -00135	vdc	-1.67		-1.89		
50 (9)	Pitch S/C - Saturn -00090	vdc	-1.12		-1.26		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC
NO. 12221
REV. A

JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
50 (10)	Pitch S/C - Saturn -00000	vdc	-0.01		+0.01		
50 (11)	Pitch S/C - Saturn +00090	vdc	+1.12		+1.26		
50 (12)	Pitch S/C - Saturn +00135	vdc	+1.67		+1.89		
50 (13)	Pitch S/C - Saturn +00160	vdc	+1.98		+2.24		
50 (14)	Pitch S/C - Saturn +00384	vdc	+4.70		+5.43		
50 (15)	Pitch S/C - Saturn +00385	vdc	+4.70		+5.44		
53 (29)	Pitch TVC -00385	vdc	-4.70		-5.44		
53 (30)	Pitch TVC -00384	vdc	-4.70		-5.43		
53 (31)	Pitch TVC -00160	vdc	-1.98		-2.24		
53 (32)	Pitch TVC -00135	vdc	-1.67		-1.89		
53 (33)	Pitch TVC -00090	vdc	-1.12		-1.26		
53 (34)	Pitch TVC +00000	vdc	-0.01		+0.01		
53 (35)	Pitch TVC +00090	vdc	+1.12		+1.26		
53 (36)	Pitch TVC +00135	vdc	+1.67		+1.89		

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JDC
NO. 12221
REV. A

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53 (37)	Pitch TVC +00160	vdc	+1.98		+2.24		
53 (38)	Pitch TVC +00384	vdc	+4.70		+5.43		
53 (39)	Pitch TVC +00385	vdc	+4.70		+5.44		
56 (5)	Yaw Att Error +00385	vac	+4.57		+5.57		
56 (6)	Yaw Att Error +00384	vac	+4.56		+5.56		
56 (7)	Yaw Att Error +00160	vac	+1.90		+2.32		
56 (8)	Yaw Att Error +00135	vac	+1.60		+1.96		
	Yaw Att Error Phase Angle	deg	-8.0		+8.0		
56 (9)	Yaw Att Error +00090	vac	+1.07		+1.31		
56 (10)	Yaw Att Error -00090	vac	-1.07		-1.31		
56 (11)	Yaw Att Error -00135	vac	-1.60		-1.96		
56 (12)	Yaw Att Error -00160	vac	-1.90		-2.32		
56 (13)	Yaw Att Error -00384	vac	-4.56		-5.56		
56 (14)	Yaw Att Error -00385	vac	-4.57		-5.57		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC
NO. 12221
REV. A

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
56 (15)	Yaw Att Error +00300	vac	-0.056		+0.056		
61	Yaw S/C - Saturn +00385	vdc	+4.70		+5.44		
62 (6)	Yaw S/C - Saturn +00384	vdc	+4.70		+5.43		
62 (7)	Yaw S/C - Saturn +00160	vdc	+1.98		+2.24		
62 (8)	Yaw S/C - Saturn +00135	vdc	+1.67		+1.89		
62 (9)	Yaw S/C - Saturn +00090	vdc	+1.12		+1.26		
62 (10)	Yaw S/C - Saturn -00090	vdc	-1.12		-1.26		
62 (11)	Yaw S/C - Saturn -00135	vdc	-1.67		-1.89		
62 (12)	Yaw S/C - Saturn -00160	vdc	-1.98		-2.24		
62 (13)	Yaw S/C - Saturn -00384	vdc	-4.70		-5.56		
62 (14)	Yaw S/C - Saturn -00385	vdc	-4.70		-5.57		
62 (15)	Yaw S/C - Saturn +00000	vdc	-0.01		+0.01		

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

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INITIAL TDRR 29882 D.S. PGS 7

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Ⓜ

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30310	All	2,4	EA	WS
B	11-3-66	31780	All	-	EA	

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Establish a Master Initialization Condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes to TB 4-43 (Hi) and 4-47 (Lo) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 199.

ATTITUDE ERROR (FDAI) TEST

4. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00013 ENTR

c. Observe
VERB 06 NOUN 01 Flashing

d. Observe
PROG lamp indicates 07

e. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

5. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00385

c. Row 2 displays -00385

d. Row 3 displays +00385

e. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

6. Enter VERB 33 into DSKY and press

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00384

c. Row 2 displays -00384

d. Row 3 displays +00384

Record the voltage indication and sign.

7. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00160

c. Row 2 displays -00160

d. Row 3 displays +00160

Record the voltage indication and sign.

8. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00135

c. Row 2 displays -00135

d. Row 3 displays +00135

Record the voltage indication and sign. Determine and record the phase angle of signal.

9. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00090

c. Row 2 displays -00090

d. Row 3 displays +00090

Record the voltage indication and sign.

10. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00000

c. Row 2 displays +00000

d. Row 3 displays -00090

Record the voltage indication and sign.

11. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00090

c. Row 2 displays +00090

d. Row 3 displays -00135

Record the voltage indication and sign.

12. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00135

c. Row 2 displays +00135

d. Row 3 displays -00160

Record the voltage indication and sign.

13. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00160

---

c. Row 2 displays +00160

d. Row 3 displays -00384

Record the voltage indication and sign.

14. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00384

c. Row 2 displays +00384

d. Row 3 displays -00385

Record the voltage indication and sign.

15. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00385

c. Row 2 displays +00385

d. Row 3 displays +00000

Record the voltage indication and sign.

16. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

17. Connect the Direct Probes to TB4-34 (Hi) and 4-38 (Lo) on TPA #2 to monitor the Roll CDU DC D/A output.

18. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

19. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing

b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

20. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing

b. Row 1 displays X6377

c. Row 3 displays 00030

21. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 06 NOUN 02 Flashing

c. Observe
Row 1 displays +00385

d. Observe
Row 2 displays -00385

e. Observe
Row 3 displays +00385

f. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

22. Repeat steps 6 through 15 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

---

23. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

YAW TVC MONITOR

24. Connect the Direct Probes to TB 4-29 (Hi) and 4-33 (Lo) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

25. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

26. Set the OPTICS MODE selector on the Indicator Control panel to MAN.

27. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 01 NOUN 10 Flashing

b. Row 1 displays X7373

c. Row 3 displays 00030

28. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 01 NOUN 10 Flashing

c. Observe
Row 1 displays 37777

d. Observe
Row 3 displays 00031

29. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 06 NOUN 03 Flashing

c. Observe
Row 1 displays +00385

d. Observe
Row 2 displays -00385

e. Observe
Row 3 displays +00003

Record the voltage indication and sign.

NOTE: Row 3 shall display +00003 until completion of step 39.

30. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays +00384

c. Row 2 displays -00384

d. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

31. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160

Record the voltage and sign indications on the DVM.

32. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135

Record the voltage indication and sign.

33. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090

Record the voltage indication and sign. Set the OPTICS CONTROLLER SPEED switch on the Indicator Control panel to HI.

34. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000

While holding the Optics Hand Controller up and left (45°) no longer than 10 seconds, record the voltage indication and sign.

35. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090

Record the voltage indication and sign. Set the OPTICS MODE switch to ZERO for 30 seconds, then return to MAN.

36. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135

Record the voltage indication and sign.

37. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160

Record the voltage indicator and sign.

38. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

---

b. Row 1 displays -00384
c. Row 2 displays +00384

Record the voltage indication and sign.

39. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385

Record the voltage indication and sign.

TEST ABORT AND RESTART

40. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00
c. VERB 57 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 00013 ENTR
f. Observe
VERB 06 NOUN 01 Flashing
g. Observe
NO ATT lamp lights
h. Observe
PROG lamp indicates 07

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

41. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall not be lighted.

PITCH (IG) CDU AC D/A MONITOR

42. Connect the Buffered Probes to TB 4-45 (Hi) and 4-49 (Lo) on TPA #2 to monitor the Pitch CDU AC Att Error.

43. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 99.

ATTITUDE ERROR (FDAI) TEST

44. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

PITCH (IG) CDU DC D/A MONITOR

45. Connect the Direct Probes to TB 4-36 (Hi) and 4-40 (Lo) on TPA #2 to monitor the Pitch CDU DC D/A output.

46. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

47. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

48. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

---

49. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
NO ATT lamp goes out
d. Observe
Row 1 displays +00385
e. Observe
Row 2 displays -00385
f. Observe
Row 3 displays +00385

Record the voltage and sign indications on the DVM.

50. Repeat steps 6 through 15 measuring the voltages on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

51. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

PITCH TVC MONITOR

52. Connect the Direct Probes to TB 4-28 (Hi) and 4-32 (Lo) on TPA #2 to monitor the Pitch TVC output.

TVC TEST

53. Repeat steps 26 through 41.

YAW (MG) CDU AC D/A MONITOR

54. Connect the Buffered Probes to TB 4-44 (Hi) and 4-48 (Lo) on TPA #2 to monitor the Yaw CDU AC Att Error.

55. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99.

ATTITUDE ERROR (FDAI) TEST

56. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

YAW (MG) CDU C/A MONITOR

57. Connect the Direct Probes to TB 4-35 (Hi) and 4-39 (Lo) on TPA #2 to monitor the Yaw CDU DC D/A output.

58. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

59. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

60. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

---

61. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
NO ATT lamp goes out
d. Observe
Row 1 displays +00385
e. Observe
Row 2 displays -00385
f. Observe
Row 3 displays +00385

Record the voltage indication and sign.

62. Repeat steps 6 through 15 measuring the voltage on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurements in step 8.

TEST ABORT

63. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall not be lighted.

64. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
NO ATT lamp is not lighted.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 7

JDC NO. 12221
REV. B
INITIAL TDRR 29882

JOB SPACECRAFT CONTROL AND DISPLAY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ___

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	Roll Att Error +00385	vac	+4.57		+5.57		
6	Roll Att Error +00384	vac	+4.56		+5.56		
7	Roll Att Error +00160	vac	+1.90		+2.32		
8	Roll Att Error +00135	vac	+1.60		+1.96		
	Roll Att Error Phase Angle	deg	-8.0		+8.0		
9	Roll Att Error +00090	vac	+1.07		+1.31		
10	Roll Att Error +00000	vac	-0.056		+0.056		
11	Roll Att Error -00090	vac	-1.07		-1.31		
12	Roll Att Error -00135	vac	-1.60		-1.96		

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EQUIPMENT TEST
DATA SHEET 2 **OF** 7

JDC
NO. 12221
REV. B

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	Roll Att Error -00160	vac	-1.90		-2.32		
14	Roll Att Error -00384	vac	-4.56		-5.56		
15	Roll Att Error -00385	vac	-4.57		-5.57		
21	Roll S/C - Saturn +00385	vdc	+4.70		+5.44		
22 (6)	Roll S/C - Saturn +00384	vdc	+4.70		+5.43		
22 (7)	Roll S/C - Saturn +00160	vdc	+1.98		+2.24		
22 (8)	Roll S/C - Saturn +00135	vdc	+1.67		+1.89		
22 (9)	Roll S/C - Saturn +00090	vdc	+1.12		+1.26		
22 (10)	Roll S/C - Saturn +00000	vdc	-0.011		+0.01		
22 (11)	Roll S/C - Saturn -00090	vdc	-1.12		-1.26		
22 (12)	Roll S/C - Saturn -00135	vdc	-1.67		-1.89		
22 (13)	Roll S/C - Saturn -00160	vdc	-1.98		-2.24		
22 (14)	Roll S/C - Saturn -00384	vdc	-4.70		-5.43		
22 (15)	Roll S/C - Saturn -00385	vdc	-4.70		-5.44		

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JDC
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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29	Yaw TVC +00385	vdc	+4.70		+5.44		
30	Yaw TVC +00384	vdc	+4.70		+5.44		
31	Yaw TVC +00160	vdc	+1.98		+2.24		
32	Yaw TVC +00135	vdc	+1.67		+1.89		
33	Yaw TVC +00090	vdc	+1.12		+1.26		
34	Yaw TVC +00000	vdc	-0.01		+0.01		
35	Yaw TVC -00090	vdc	-1.12		-1.26		
36	Yaw TVC -000135	vdc	-1.67		-1.89		
37	Yaw TVC -00160	vdc	-1.98		-2.24		
38	Yaw TVC -00384	vdc	-4.70		-5.43		
39	Yaw TVC -00385	vdc	-4.70		-5.44		
44 (5)	Pitch Att Error -00385	vac	-4.57		-5.57		
44 (6)	Pitch Att Error -00384	vac	-4.56		-5.56		
44 (7)	Pitch Att Error -00160	vac	-1.90		-2.32		

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JDC
NO. 12221
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JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
44 (8)	Pitch Att Error -00135	vac	-1.60		-1.96		
	Pitch Att Error Phase Angle	deg	+172.0		+188.0		
44 (9)	Pitch Att Error -00090	vac	-1.07		-1.31		
44 (10)	Pitch Att Error +00000	vac	-0.056		+0.056		
44 (11)	Pitch Att Error +00090	vac	+1.07		+1.31		
44 (12)	Pitch Att Error +00135	vac	+1.60		+1.96		
44 (13)	Pitch Att Error +00160	vac	+1.90		+2.32		
44 (14)	Pitch Att Error +00384	vac	+4.56		+5.56		
44 (15)	Pitch Att Error +00385	vac	+4.57		+5.57		
49	Pitch S/C - Saturn -00385	vdc	-4.70		-5.44		
50 (6)	Pitch S/C - Saturn -00384	vdc	-4.70		-5.43		
50 (7)	Pitch S/C - Saturn -00160	vdc	-1.98		-2.24		
50 (8)	Pitch S/C - Saturn -00135	vdc	-1.67		-1.89		
50 (9)	Pitch S/C - Saturn -00090	vdc	-1.12		-1.26		

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JDC
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JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
50 (10)	Pitch S/C - Saturn -00000	vdc	-0.01		+0.01		
50 (11)	Pitch S/C - Saturn +00090	vdc	+1.12		+1.26		
50 (12)	Pitch S/C - Saturn +00135	vdc	+1.67		+1.89		
50 (13)	Pitch S/C - Saturn +00160	vdc	+1.98		+2.24		
50 (14)	Pitch S/C - Saturn +00384	vdc	+4.70		+5.43		
50 (15)	Pitch S/C - Saturn +00385	vdc	+4.70		+5.44		
53 (29)	Pitch TVC -00385	vdc	-4.70		-5.44		
53 (30)	Pitch TVC -00384	vdc	-4.70		-5.43		
53 (31)	Pitch TVC -00160	vdc	-1.98		-2.24		
53 (32)	Pitch TVC -00135	vdc	-1.67		-1.89		
53 (33)	Pitch TVC -00090	vdc	-1.12		-1.26		
53 (34)	Pitch TVC +00000	vdc	-0.01		+0.01		
53 (35)	Pitch TVC +00090	vdc	+1.12		+1.26		
53 (36)	Pitch TVC +00135	vdc	+1.67		+1.89		

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DATA SHEET 6 OF 7

JDC
NO. 12221
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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53 (37)	Pitch TVC +00160	vdc	+1.98		+2.24		
53 (38)	Pitch TVC +00384	vdc	+4.70		+5.43		
53 (39)	Pitch TVC +00385	vdc	+4.70		+5.44		
56 (5)	Yaw Att Error +00385	vac	+4.57		+5.57		
56 (6)	Yaw Att Error +00384	vac	+4.56		+5.56		
56 (7)	Yaw Att Error +00160	vac	+1.90		+2.32		
56 (8)	Yaw Att Error +00135	vac	+1.60		+1.96		
	Yaw Att Error Phase Angle	deg	-8.0		+8.0		
56 (9)	Yaw Att Error +00090	vac	+1.07		+1.31		
56 (10)	Yaw Att Error -00090	vac	-1.07		-1.31		
56 (11)	Yaw Att Error -00135	vac	-1.60		-1.96		
56 (12)	Yaw Att Error -00160	vac	-1.90		-2.32		
56 (13)	Yaw Att Error -00384	vac	-4.56		-5.56		
56 (14)	Yaw Att Error -00385	vac	-4.57		-5.57		

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DATA SHEET 7 OF 7

JDC
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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
56 (15)	Yaw Att Error +00300	vac	-0.056		+0.056		
61	Yaw S/C - Saturn +00385	vdc	+4.70		+5.44		
62 (6)	Yaw S/C - Saturn +00384	vdc	+4.70		+5.43		
62 (7)	Yaw S/C - Saturn +00160	vdc	+1.98		+2.24		
62 (8)	Yaw S/C - Saturn +00135	vdc	+1.67		+1.89		
62 (9)	Yaw S/C - Saturn +00090	vdc	+1.12		+1.26		
62 (10)	Yaw S/C - Saturn -00090	vdc	-1.12		-1.26		
62 (11)	Yaw S/C - Saturn -00135	vdc	-1.67		-1.89		
62 (12)	Yaw S/C - Saturn -00160	vdc	-1.98		-2.24		
62 (13)	Yaw S/C - Saturn -00384	vdc	-4.70		-5.56		
62 (14)	Yaw S/C - Saturn -00385	vdc	-4.70		-5.57		
62 (15)	Yaw S/C - Saturn +00000	vdc	-0.01		+0.01		

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

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INITIAL TDRR 29882 D.S. PGS 7

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30310	All	2,4	EA	WS
B	11-3-66	31780	All	-	EA	
C	11-10-66	31899	4,5	-	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Establish a Master Initialization Condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes to TB 4-43 (Hi) and 4-47 (Lo) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 199.

ATTITUDE ERROR (FDAI) TEST

4. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00013 ENTR

c. Observe
VERB 06 NOUN 01 Flashing

d. Observe
PROG lamp indicates 07

e. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

5. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00385

c. Row 2 displays -00385

d. Row 3 displays +00385

e. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

6. Enter VERB 33 into DSKY and press

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV C PAGE 2 OF 8

SUBSYSTEM G & N SYSTEM

ASSY

ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00384

c. Row 2 displays -00384

d. Row 3 displays +00384

Record the voltage indication and sign.

7. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00160

c. Row 2 displays -00160

d. Row 3 displays +00160

Record the voltage indication and sign.

8. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00135

c. Row 2 displays -00135

d. Row 3 displays +00135

Record the voltage indication and sign.

Determine and record the phase angle of signal.

9. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00090

c. Row 2 displays -00090

d. Row 3 displays +00090

Record the voltage indication and sign.

10. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00000

c. Row 2 displays +00000

d. Row 3 displays -00090

Record the voltage indication and sign.

11. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00090

c. Row 2 displays +00090

d. Row 3 displays -00135

Record the voltage indication and sign.

12. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00135

c. Row 2 displays +00135

d. Row 3 displays -00160

Record the voltage indication and sign.

13. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00160

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV C PAGE 3 OF 8

SUBSYSTEM G & N SYSTEM

ASSY

c. Row 2 displays +00160

d. Row 3 displays -00384

Record the voltage indication and sign.

14. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00384

c. Row 2 displays +00384

d. Row 3 displays -00385

Record the voltage indication and sign.

15. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00385

c. Row 2 displays +00385

d. Row 3 displays +00000

Record the voltage indication and sign.

16. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

17. Connect the Direct Probes to TB4-34 (Hi) and 4-38 (Lo) on TPA #2 to monitor the Roll CDU DC D/A output.

18. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

19. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing

b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

20. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing

b. Row 1 displays X6377

c. Row 3 displays 00030

21. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 06 NOUN 02 Flashing

c. Observe
Row 1 displays +00385

d. Observe
Row 2 displays -00385

e. Observe
Row 3 displays +00385

f. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

22. Repeat steps 6 through 15 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV C PAGE 4 OF 8

SUBSYSTEM G & N SYSTEM

ASSY

23. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

YAW TVC MONITOR

24. Connect the Direct Probes to TB 4-29 (Hi) and 4-33 (Lo) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

25. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

26. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Set the OPTICS MODE selector on the Indicator Control panel to MAN.

27. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 01 NOUN 10 Flashing

b. Row 1 displays X7373

c. Row 3 displays 00030

28. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 01 NOUN 10 Flashing

c. Observe
Row 1 displays 37777

d. Observe
Row 3 displays 00031

29. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 06 NOUN 03 Flashing

c. Observe
Row 1 displays +00385

d. Observe
Row 2 displays -00385

e. Observe
Row 3 displays +00003

Record the voltage indication and sign.

NOTE: Row 3 shall display +00003 until completion of step 39.

30. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays +00384

c. Row 2 displays -00384

d. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

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FORM 00144
Chg. 7-23-65

31. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays +00160

c. Row 2 displays -00160

Record the voltage and sign indications on the DVM.

32. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays +00135

c. Row 2 displays -00135

Record the voltage indication and sign.

33. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays +00090

c. Row 2 displays -00090

Record the voltage indication and sign. Set the OPTICS CONTROLLER SPEED switch on the Indicator Control panel to HI.

34. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays +00000

c. Row 2 displays +00000

While holding the Optics Hand Controller up and left (45°) no longer than 10 seconds, record the voltage indication and sign.

35. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays -00090

c. Row 2 displays +00090

Record the voltage indication and sign. Set the OPTICS MODE switch to ZERO for 30 seconds, then return to MAN. Press OPTICS POWER ON pushbutton on Test Control panel so that OPTICS POWER ON pushbutton shall go out.

36. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays -00135

c. Row 2 displays +00135

Record the voltage indication and sign.

37. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays -00160

c. Row 2 displays +00160

Record the voltage indicator and sign.

38. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

---

b. Row 1 displays -00384

c. Row 2 displays +00384

Record the voltage indication and sign.

39. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays -00385

c. Row 2 displays +00385

Record the voltage indication and sign.

TEST ABORT AND RESTART

40. Perform the following DSKY operations:

a. VERB 34 ENTR

b. Observe
PROG lamp indicates 00

c. VERB 57 ENTR

d. Observe
VERB 21 NOUN 01 Flashing

e. 00013 ENTR

f. Observe
VERB 06 NOUN 01 Flashing

g. Observe
NO ATT lamp lights

h. Observe
PROG lamp indicates 07

Observe the Gimbal Angles, approximately 0^{c}, are displayed on Row 1, Row 2 and Row 3.

41. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall not be lighted.

PITCH (IG) CDU AC D/A MONITOR

42. Connect the Buffered Probes to TB 4-45 (Hi) and 4-49 (Lo) on TPA #2 to monitor the Pitch CDU AC Att Error.

43. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 99.

ATTITUDE ERROR (FDAI) TEST

44. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

PITCH (IG) CDU DC D/A MONITOR

45. Connect the Direct Probes to TB 4-36 (Hi) and 4-40 (Lo) on TPA #2 to monitor the Pitch CDU DC D/A output.

46. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

47. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing

b. Observe
NO ATT lamp lights

48. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing

b. Row 1 displays X6377

c. Row 3 displays 00030

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

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49. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 06 NOUN 02 Flashing

c. Observe
NO ATT lamp goes out

d. Observe
Row 1 displays +00385

e. Observe
Row 2 displays -00385

f. Observe
Row 3 displays +00385

Record the voltage and sign indications on the DVM.

50. Repeat steps 6 through 15 measuring the voltages on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

51. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0^{c}, are displayed on Row 1, Row 2 and Row 3.

PITCH TVC MONITOR

52. Connect the Direct Probes to TB 4-28 (Hi) and 4-32 (Lo) on TPA #2 to monitor the Pitch TVC output.

TVC TEST

53. Repeat steps 26 through 41.

YAW (MG) CDU AC D/A MONITOR

54. Connect the Buffered Probes to TB 4-44 (Hi) and 4-48 (Lo) on TPA #2 to monitor the Yaw CDU AC Att Error.

55. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99.

ATTITUDE ERROR (FDAI) TEST

56. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

YAW (MG) CDU C/A MONITOR

57. Connect the Direct Probes to TB 4-35 (Hi) and 4-39 (Lo) on TPA #2 to monitor the Yaw CDU DC D/A output.

58. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

59. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 02 Flashing

b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0^{c}, are displayed on Row 1, Row 2 and Row 3.

60. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing

b. Row 1 displays X6377

c. Row 3 displays 00030

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61. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 06 NOUN 02 Flashing

c. Observe
NO ATT lamp goes out

d. Observe
Row 1 displays +00385

e. Observe
Row 2 displays -00385

f. Observe
Row 3 displays +00385

Record the voltage indication and sign.

62. Repeat steps 6 through 15 measuring the voltage on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurements in step 8.

TEST ABORT

63. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall not be lighted.

64. Perform the following DSKY operations:

a. VERB 34 ENTR

b. Observe
NO ATT lamp is not lighted.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12221
REV. C
INITIAL TDRR 29882

JOB SPACECRAFT CONTROL AND DISPLAY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	Roll Att Error +00385	vac	+4.57		+5.57		
6	Roll Att Error +00384	vac	+4.56		+5.56		
7	Roll Att Error +00160	vac	+1.90		+2.32		
8	Roll Att Error +00135	vac	+1.60		+1.96		
	Roll Att Error Phase Angle	deg	-8.0		+8.0		
9	Roll Att Error +00090	vac	+1.07		+1.31		
10	Roll Att Error +00000	vac	-0.056		+0.056		
11	Roll Att Error -00090	vac	-1.07		-1.31		
12	Roll Att Error -00135	vac	-1.60		-1.96		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12221
REV. C

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	Roll Att Error -00160	vac	-1.90		-2.32		
14	Roll Att Error -00384	vac	-4.56		-5.56		
15	Roll Att Error -00385	vac	-4.57		-5.57		
21	Roll S/C - Saturn +00385	vdc	+4.70		+5.44		
22 (6)	Roll S/C - Saturn +00384	vdc	+4.70		+5.43		
22 (7)	Roll S/C - Saturn +00160	vdc	+1.98		+2.24		
22 (8)	Roll S/C - Saturn +00135	vdc	+1.67		+1.89		
22 (9)	Roll S/C - Saturn +00090	vdc	+1.12		+1.26		
22 (10)	Roll S/C - Saturn +00000	vdc	-0.011		+0.01		
22 (11)	Roll S/C - Saturn -00090	vdc	-1.12		-1.26		
22 (12)	Roll S/C - Saturn -00135	vdc	-1.67		-1.89		
22 (13)	Roll S/C - Saturn -00160	vdc	-1.98		-2.24		
22 (14)	Roll S/C - Saturn -00384	vdc	-4.70		-5.43		
22 (15)	Roll S/C - Saturn -00385	vdc	-4.70		-5.44		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12221
REV. C

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29	Yaw TVC +00385	vdc	+4.70		+5.44		
30	Yaw TVC +00384	vdc	+4.70		+5.44		
31	Yaw TVC +00160	vdc	+1.98		+2.24		
32	Yaw TVC +00135	vdc	+1.67		+1.89		
33	Yaw TVC +00090	vdc	+1.12		+1.26		
34	Yaw TVC +00000	vdc	-0.01		+0.01		
35	Yaw TVC -00090	vdc	-1.12		-1.26		
36	Yaw TVC -000135	vdc	-1.67		-1.89		
37	Yaw TVC -00160	vdc	-1.98		-2.24		
38	Yaw TVC -00384	vdc	-4.70		-5.43		
39	Yaw TVC -00385	vdc	-4.70		-5.44		
44 (5)	Pitch Att Error -00385	vac	-4.57		-5.57		
44 (6)	Pitch Att Error -00384	vac	-4.56		-5.56		
44 (7)	Pitch Att Error -00160	vac	-1.90		-2.32		

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EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12221
REV. C

JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
44 (8)	Pitch Att Error -00135	vac	-1.60		-1.96		
	Pitch Att Error Phase Angle	deg	+172.0		+188.0		
44 (9)	Pitch Att Error -00090	vac	-1.07		-1.31		
44 (10)	Pitch Att Error +00000	vac	-0.056		+0.056		
44 (11)	Pitch Att Error +00090	vac	+1.07		+1.31		
44 (12)	Pitch Att Error +00135	vac	+1.60		+1.96		
44 (13)	Pitch Att Error +00160	vac	+1.90		+2.32		
44 (14)	Pitch Att Error +00384	vac	+4.56		+5.56		
44 (15)	Pitch Att Error +00385	vac	+4.57		+5.57		
49	Pitch S/C - Saturn -00385	vdc	-4.70		-5.44		
50 (6)	Pitch S/C - Saturn -00384	vdc	-4.70		-5.43		
50 (7)	Pitch S/C - Saturn -00160	vdc	-1.98		-2.24		
50 (8)	Pitch S/C - Saturn -00135	vdc	-1.67		-1.89		
50 (9)	Pitch S/C - Saturn -00090	vdc	-1.12		-1.26		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 **OF** 7

JDC
NO. 12221
REV. C

JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
50 (10)	Pitch S/C - Saturn -00000	vdc	-0.01		+0.01		
50 (11)	Pitch S/C - Saturn +00090	vdc	+1.12		+1.26		
50 (12)	Pitch S/C - Saturn +00135	vdc	+1.67		+1.89		
50 (13)	Pitch S/C - Saturn +00160	vdc	+1.98		+2.24		
50 (14)	Pitch S/C - Saturn +00384	vdc	+4.70		+5.43		
50 (15)	Pitch S/C - Saturn +00385	vdc	+4.70		+5.44		
53 (29)	Pitch TVC -00385	vdc	-4.70		-5.44		
53 (30)	Pitch TVC -00384	vdc	-4.70		-5.43		
53 (31)	Pitch TVC -00160	vdc	-1.98		-2.24		
53 (32)	Pitch TVC -00135	vdc	-1.67		-1.89		
53 (33)	Pitch TVC -00090	vdc	-1.12		-1.26		
53 (34)	Pitch TVC +00000	vdc	-0.01		+0.01		
53 (35)	Pitch TVC +00090	vdc	+1.12		+1.26		
53 (36)	Pitch TVC +00135	vdc	+1.67		+1.89		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 **OF** 7

JDC
NO. 12221
REV. C

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53 (37)	Pitch TVC +00160	vdc	+1.98		+2.24		
53 (38)	Pitch TVC +00384	vdc	+4.70		+5.43		
53 (39)	Pitch TVC +00385	vdc	+4.70		+5.44		
56 (5)	Yaw Att Error +00385	vac	+4.57		+5.57		
56 (6)	Yaw Att Error +00384	vac	+4.56		+5.56		
56 (7)	Yaw Att Error +00160	vac	+1.90		+2.32		
56 (8)	Yaw Att Error +00135	vac	+1.60		+1.96		
	Yaw Att Error Phase Angle	deg	-8.0		+8.0		
56 (9)	Yaw Att Error +00090	vac	+1.07		+1.31		
56 (10)	Yaw Att Error -00090	vac	-1.07		-1.31		
56 (11)	Yaw Att Error -00135	vac	-1.60		-1.96		
56 (12)	Yaw Att Error -00160	vac	-1.90		-2.32		
56 (13)	Yaw Att Error -00384	vac	-4.56		-5.56		
56 (14)	Yaw Att Error -00385	vac	-4.57		-5.57		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 7

JDC
NO. 12221
REV. C

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
56 (15)	Yaw Att Error +00300	vac	-0.056		+0.056		
61	Yaw S/C - Saturn +00385	vdc	+4.70		+5.44		
62 (6)	Yaw S/C - Saturn +00384	vdc	+4.70		+5.43		
62 (7)	Yaw S/C - Saturn +00160	vdc	+1.98		+2.24		
62 (8)	Yaw S/C - Saturn +00135	vdc	+1.67		+1.89		
62 (9)	Yaw S/C - Saturn +00090	vdc	+1.12		+1.26		
62 (10)	Yaw S/C - Saturn -00090	vdc	-1.12		-1.26		
62 (11)	Yaw S/C - Saturn -00135	vdc	-1.67		-1.89		
62 (12)	Yaw S/C - Saturn -00160	vdc	-1.98		-2.24		
62 (13)	Yaw S/C - Saturn -00384	vdc	-4.70		-5.56		
62 (14)	Yaw S/C - Saturn -00385	vdc	-4.70		-5.57		
62 (15)	Yaw S/C - Saturn +00000	vdc	-0.01		+0.01		

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV. D PAGE 1 OF 8
INITIAL TDRR 29882 D.S. PGS 7

SUBSYSTEM G & N SYSTEM
ASSY.
DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30310	All	2,4	EA	WS
B	11-3-66	31780	All	-	EA	
C	11-10-66	31899	4,5	-	EA	-
D	11-15-66	31945	1,6,7	7	EA	-

REFERENCES PS-2015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: DSKY displays specified in this JDC may in some cases be delayed approximately 15 seconds.

1. Establish a Master Initialization Condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes to TB 4-43 (Hi) and 4-47 (Lo) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 199.

ATTITUDE ERROR (FDAI) TEST

4. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00013 ENTR
c. Observe
VERB 06 NOUN 01 Flashing
d. Observe
PROG lamp indicates 07
e. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

5. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

6. Enter VERB 33 into DSKY and press

VERIFICATION WITH SIDL REQUIRED BEFORE USE

ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Row 3 displays +00384

Record the voltage indication and sign.

7. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160
d. Row 3 displays +00160

Record the voltage indication and sign.

8. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135
d. Row 3 displays +00135

Record the voltage indication and sign. Determine and record the phase angle of signal.

9. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090
d. Row 3 displays +00090

Record the voltage indication and sign.

10. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000
d. Row 3 displays -00090

Record the voltage indication and sign.

11. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090
d. Row 3 displays -00135

Record the voltage indication and sign.

12. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135
d. Row 3 displays -00160

Record the voltage indication and sign.

13. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays -00160

---

c. Row 2 displays +00160
d. Row 3 displays -00384

Record the voltage indication and sign.

14. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384
d. Row 3 displays -00385

Record the voltage indication and sign.

15. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385
d. Row 3 displays +00000

Record the voltage indication and sign.

16. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

17. Connect the Direct Probes to TB4-34 (Hi) and 4-38 (Lo) on TPA #2 to monitor the Roll CDU DC D/A output.

18. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

19. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

20. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

21. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
Row 1 displays +00385
d. Observe
Row 2 displays -00385
e. Observe
Row 3 displays +00385
f. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

22. Repeat steps 6 through 15 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

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23. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

YAW TVC MONITOR

24. Connect the Direct Probes to TB 4-29 (Hi) and 4-33 (Lo) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

25. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

26. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Set the OPTICS MODE selector on the Indicator Control panel to MAN.

27. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 01 NOUN 10 Flashing
b. Row 1 displays X7373
c. Row 3 displays 00030

28. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 01 NOUN 10 Flashing
c. Observe
Row 1 displays 37777
d. Observe
Row 3 displays 00031

29. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 03 Flashing
c. Observe
Row 1 displays +00385
d. Observe
Row 2 displays -00385
e. Observe
Row 3 displays +00003

Record the voltage indication and sign.

NOTE: Row 3 shall display +00003 until completion of step 39.

30. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

31. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160

Record the voltage and sign indications on the DVM.

32. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135

Record the voltage indication and sign.

33. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090

Record the voltage indication and sign. Set the OPTICS CONTROLLER SPEED switch on the Indicator Control panel to HI.

34. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000

While holding the Optics Hand Controller up and left (45°) no longer than 10 seconds, record the voltage indication and sign.

35. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090

Record the voltage indication and sign. Set the OPTICS MODE switch to ZERO for 30 seconds, then return to MAN.

36. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135

Record the voltage indication and sign.

37. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160

Record the voltage indicator and sign.

38. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

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b. Row 1 displays -00384
c. Row 2 displays +00384

Record the voltage indication and sign.

39. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385

Record the voltage indication and sign.

TEST ABORT AND RESTART

40. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00
c. VERB 57 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 00013 ENTR
f. Observe
VERB 06 NOUN 01 Flashing
g. Observe
NO ATT lamp lights
h. Observe
PROG lamp indicates 07

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

41. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall not be lighted.

PITCH (IG) CDU AC D/A MONITOR

42. Connect the Buffered Probes to TB 4-45 (Hi) and 4-49 (Lo) on TPA #2 to monitor the Pitch CDU AC Att Error.

43. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 99.

ATTITUDE ERROR (FDAI) TEST

44. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

PITCH (IG) CDU DC D/A MONITOR

45. Connect the Direct Probes to TB 4-36 (Hi) and 4-40 (Lo) on TPA #2 to monitor the Pitch CDU DC D/A output.

46. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

47. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

48. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

---

49. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
NO ATT lamp goes out
d. Observe
Row 1 displays +00385
e. Observe
Row 2 displays -00385
f. Observe
Row 3 displays +00385

Record the voltage and sign indications on the DVM.

50. Repeat steps 6 through 15 measuring the voltages on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

51. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

PITCH TVC MONITOR

52. Connect the Direct Probes to TB 4-28 (Hi) and 4-32 (Lo) on TPA #2 to monitor the Pitch TVC output.

TVC TEST

53. Repeat steps 25 through 41.

YAW (MG) CDU AC D/A MONITOR

54. Connect the Buffered Probes to TB 4-44 (Hi) and 4-48 (Lo) on TPA #2 to monitor the Yaw CDU AC Att Error.

55. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99.

ATTITUDE ERROR (FDAI) TEST

56. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

YAW (MG) CDU C/A MONITOR

57. Connect the Direct Probes to TB 4-35 (Hi) and 4-39 (Lo) on TPA #2 to monitor the Yaw CDU DC D/A output.

58. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

59. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

60. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

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61. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
NO ATT lamp goes out
d. Observe
Row 1 displays +00385
e. Observe
Row 2 displays -00385
f. Observe
Row 3 displays +00385

Record the voltage indication and sign.

62. Repeat steps 6 through 15 measuring the voltage on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurements in step 8.

TEST ABORT

63. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall not be lighted.

64. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
NO ATT lamp is not lighted.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 7

JDC
NO. 12221
REV. D
INITIAL TDRR 29882

JOB SPACECRAFT CONTROL AND DISPLAY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ___

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	Roll Att Error +00385	vac	+4.57		+5.57		
6	Roll Att Error +00384	vac	+4.56		+5.56		
7	Roll Att Error +00160	vac	+1.90		+2.32		
8	Roll Att Error +00135	vac	+1.60		+1.96		
	Roll Att Error Phase Angle	deg	-8.0		+8.0		
9	Roll Att Error +00090	vac	+1.07		+1.31		
10	Roll Att Error +00000	vac	-0.056		+0.056		
11	Roll Att Error -00090	vac	-1.07		-1.31		
12	Roll Att Error -00135	vac	-1.60		-1.96		

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JDC
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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	Roll Att Error -00160	vac	-1.90		-2.32		
14	Roll Att Error -00384	vac	-4.56		-5.56		
15	Roll Att Error -00385	vac	-4.57		-5.57		
21	Roll S/C - Saturn +00385	vdc	+4.70		+5.44		
22 (6)	Roll S/C - Saturn +00384	vdc	+4.70		+5.43		
22 (7)	Roll S/C - Saturn +00160	vdc	+1.98		+2.24		
22 (8)	Roll S/C - Saturn +00135	vdc	+1.67		+1.89		
22 (9)	Roll S/C - Saturn +00090	vdc	+1.12		+1.26		
22 (10)	Roll S/C - Saturn +00000	vdc	-0.011		+0.01		
22 (11)	Roll S/C - Saturn -00090	vdc	-1.12		-1.26		
22 (12)	Roll S/C - Saturn -00135	vdc	-1.67		-1.89		
22 (13)	Roll S/C - Saturn -00160	vdc	-1.98		-2.24		
22 (14)	Roll S/C - Saturn -00384	vdc	-4.70		-5.43		
22 (15)	Roll S/C - Saturn -00385	vdc	-4.70		-5.44		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29	Yaw TVC +00385	vdc	+4.70		+5.44		
30	Yaw TVC +00384	vdc	+4.70		+5.44		
31	Yaw TVC +00160	vdc	+1.98		+2.24		
32	Yaw TVC +00135	vdc	+1.67		+1.89		
33	Yaw TVC +00090	vdc	+1.12		+1.26		
34	Yaw TVC +00000	vdc	-0.01		+0.01		
35	Yaw TVC -00090	vdc	-1.12		-1.26		
36	Yaw TVC -000135	vdc	-1.67		-1.89		
37	Yaw TVC -00160	vdc	-1.98		-2.24		
38	Yaw TVC -00384	vdc	-4.70		-5.43		
39	Yaw TVC -00385	vdc	-4.70		-5.44		
44 (5)	Pitch Att Error -00385	vac	-4.57		-5.57		
44 (6)	Pitch Att Error -00384	vac	-4.56		-5.56		
44 (7)	Pitch Att Error -00160	vac	-1.90		-2.32		

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JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
44 (8)	Pitch Att Error -00135	vac	-1.60		-1.96		
	Pitch Att Error Phase Angle	deg	+172.0		+188.0		
44 (9)	Pitch Att Error -00090	vac	-1.07		-1.31		
44 (10)	Pitch Att Error +00000	vac	-0.056		+0.056		
44 (11)	Pitch Att Error +00090	vac	+1.07		+1.31		
44 (12)	Pitch Att Error +00135	vac	+1.60		+1.96		
44 (13)	Pitch Att Error +00160	vac	+1.90		+2.32		
44 (14)	Pitch Att Error +00384	vac	+4.56		+5.56		
44 (15)	Pitch Att Error +00385	vac	+4.57		+5.57		
49	Pitch S/C - Saturn -00385	vdc	-4.70		-5.44		
50 (6)	Pitch S/C - Saturn -00384	vdc	-4.70		-5.43		
50 (7)	Pitch S/C - Saturn -00160	vdc	-1.98		-2.24		
50 (8)	Pitch S/C - Saturn -00135	vdc	-1.67		-1.89		
50 (9)	Pitch S/C - Saturn -00090	vdc	-1.12		-1.26		

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JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
50 (10)	Pitch S/C - Saturn -00000	vdc	-0.01		+0.01		
50 (11)	Pitch S/C - Saturn +00090	vdc	+1.12		+1.26		
50 (12)	Pitch S/C - Saturn +00135	vdc	+1.67		+1.89		
50 (13)	Pitch S/C - Saturn +00160	vdc	+1.98		+2.24		
50 (14)	Pitch S/C - Saturn +00384	vdc	+4.70		+5.43		
50 (15)	Pitch S/C - Saturn +00385	vdc	+4.70		+5.44		
53 (29)	Pitch TVC -00385	vdc	-4.70		-5.44		
53 (30)	Pitch TVC -00384	vdc	-4.70		-5.43		
53 (31)	Pitch TVC -00160	vdc	-1.98		-2.24		
53 (32)	Pitch TVC -00135	vdc	-1.67		-1.89		
53 (33)	Pitch TVC -00090	vdc	-1.12		-1.26		
53 (34)	Pitch TVC +00000	vdc	-0.01		+0.01		
53 (35)	Pitch TVC +00090	vdc	+1.12		+1.26		
53 (36)	Pitch TVC +00135	vdc	+1.67		+1.89		

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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53 (37)	Pitch TVC +00160	vdc	+1.98		+2.24		
53 (38)	Pitch TVC +00384	vdc	+4.70		+5.43		
53 (39)	Pitch TVC +00385	vdc	+4.70		+5.44		
56 (5)	Yaw Att Error +00385	vac	+4.57		+5.57		
56 (6)	Yaw Att Error +00384	vac	+4.56		+5.56		
56 (7)	Yaw Att Error +00160	vac	+1.90		+2.32		
56 (8)	Yaw Att Error +00135	vac	+1.60		+1.96		
	Yaw Att Error Phase Angle	deg	-8.0		+8.0		
56 (9)	Yaw Att Error +00090	vac	+1.07		+1.31		
56 (10)	Yaw Att Error -00090	vac	-1.07		-1.31		
56 (11)	Yaw Att Error -00135	vac	-1.60		-1.96		
56 (12)	Yaw Att Error -00160	vac	-1.90		-2.32		
56 (13)	Yaw Att Error -00384	vac	-4.56		-5.56		
56 (14)	Yaw Att Error -00385	vac	-4.57		-5.57		

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JDC
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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
56 (15)	Yaw Att Error +00000	vac	-0.056		+0.056		
61	Yaw S/C - Saturn +00385	vdc	+4.70		+5.44		
62 (6)	Yaw S/C - Saturn +00384	vdc	+4.70		+5.43		
62 (7)	Yaw S/C - Saturn +00160	vdc	+1.98		+2.24		
62 (8)	Yaw S/C - Saturn +00135	vdc	+1.67		+1.89		
62 (9)	Yaw S/C - Saturn +00090	vdc	+1.12		+1.26		
62 (10)	Yaw S/C - Saturn -00090	vdc	-1.12		-1.26		
62 (11)	Yaw S/C - Saturn -00135	vdc	-1.67		-1.89		
62 (12)	Yaw S/C - Saturn -00160	vdc	-1.98		-2.24		
62 (13)	Yaw S/C - Saturn -00384	vdc	-4.70		-5.56		
62 (14)	Yaw S/C - Saturn -00385	vdc	-4.70		-5.57		
62 (15)	Yaw S/C - Saturn +00000	vdc	-0.01		+0.01		

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JOB - SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV. E PAGE 1 OF 8

INITIAL TDRR 29882 D.S. PGS 7

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30310	All	2,4	EA	WS
B	11-3-66	31780	All	-	EA	
C	11-10-66	31899	4,5	-	EA	-
D	11-15-66	31945	1,6,7	7	EA	-
E	9-6-67	34560	1	-	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: DSKY displays specified in this JDC may in some cases be delayed approximately 15 seconds.

1. Establish a Master Initialization Condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes to TB 4-43 (Hi) and 4-47 (Lo) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 199.

ATTITUDE ERROR (FDAI) TEST

4. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00013 ENTR

c. Observe
VERB 06 NOUN 01 Flashing

d. Observe
PROG lamp indicates 07

e. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

5. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00385

c. Row 2 displays -00385

d. Row 3 displays +00385

e. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

6. Enter VERB 33 into DSKY and press

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM 0C143A
Chg. 3-15-66

JOB SPACECRAFT DISPLAY AND CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00384

c. Row 2 displays -00384

d. Row 3 displays +00384

Record the voltage indication and sign.

7. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00160

c. Row 2 displays -00160

d. Row 3 displays +00160

Record the voltage indication and sign.

8. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00135

c. Row 2 displays -00135

d. Row 3 displays +00135

Record the voltage indication and sign.

Determine and record the phase angle of signal.

9. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00090

c. Row 2 displays -00090

d. Row 3 displays +00090

Record the voltage indication and sign.

10. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00000

c. Row 2 displays +00000

d. Row 3 displays -00090

Record the voltage indication and sign.

11. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00090

c. Row 2 displays +00090

d. Row 3 displays -00135

Record the voltage indication and sign.

12. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00135

c. Row 2 displays +00135

d. Row 3 displays -00160

Record the voltage indication and sign.

13. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00160

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV E PAGE 3 OF 8

SUBSYSTEM G & N SYSTEM

ASSY

c. Row 2 displays +00160

d. Row 3 displays -00384

Record the voltage indication and sign.

14. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00384

c. Row 2 displays +00384

d. Row 3 displays -00385

Record the voltage indication and sign.

15. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00385

c. Row 2 displays +00385

d. Row 3 displays +00000

Record the voltage indication and sign.

16. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

17. Connect the Direct Probes to TB4-34 (Hi) and 4-38 (Lo) on TPA #2 to monitor the Roll CDU DC D/A output.

18. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

19. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing

b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

20. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing

b. Row 1 displays X6377

c. Row 3 displays 00030

21. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 06 NOUN 02 Flashing

c. Observe
Row 1 displays +00385

d. Observe
Row 2 displays -00385

e. Observe
Row 3 displays +00385

f. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

22. Repeat steps 6 through 15 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

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SUBSYSTEM G & N SYSTEM

ASSY

23. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

YAW TVC MONITOR

24. Connect the Direct Probes to TB 4-29 (Hi) and 4-33 (Lo) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

25. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

26. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. Set the OPTICS MODE selector on the Indicator Control panel to MAN.

27. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 01 NOUN 10 Flashing

b. Row 1 displays X7373

c. Row 3 displays 00030

28. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 01 NOUN 10 Flashing

c. Observe
Row 1 displays 37777

d. Observe
Row 3 displays 00031

29. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 06 NOUN 03 Flashing

c. Observe
Row 1 displays +00385

d. Observe
Row 2 displays -00385

e. Observe
Row 3 displays +00003

Record the voltage indication and sign.

NOTE: Row 3 shall display +00003 until completion of step 39.

30. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Row 1 displays +00384

c. Row 2 displays -00384

d. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

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31. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160

Record the voltage and sign indications on the DVM.

32. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135

Record the voltage indication and sign.

33. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090

Record the voltage indication and sign. Set the OPTICS CONTROLLER SPEED switch on the Indicator Control panel to HI.

34. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000

While holding the Optics Hand Controller up and left (45°) no longer than 10 seconds, record the voltage indication and sign.

35. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090

Record the voltage indication and sign. Set the OPTICS MODE switch to ZERO for 30 seconds, then return to MAN.

36. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135

Record the voltage indication and sign.

37. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160

Record the voltage indicator and sign.

38. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

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b. Row 1 displays -00384
c. Row 2 displays +00384

Record the voltage indication and sign.

39. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385

Record the voltage indication and sign.

TEST ABORT AND RESTART

40. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00
c. VERB 57 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 00013 ENTR
f. Observe
VERB 06 NOUN 01 Flashing
g. Observe
NO ATT lamp lights
h. Observe
PROG lamp indicates 07

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

41. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall not be lighted.

PITCH (IG) CDU AC D/A MONITOR

42. Connect the Buffered Probes to TB 4-45 (Hi) and 4-49 (Lo) on TPA #2 to monitor the Pitch CDU AC Att Error.

43. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 99.

ATTITUDE ERROR (FDAI) TEST

44. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

PITCH (IG) CDU DC D/A MONITOR

45. Connect the Direct Probes to TB 4-36 (Hi) and 4-40 (Lo) on TPA #2 to monitor the Pitch CDU DC D/A output.

46. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

47. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

48. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

---

49. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
NO ATT lamp goes out
d. Observe
Row 1 displays +00385
e. Observe
Row 2 displays -00385
f. Observe
Row 3 displays +00385

Record the voltage and sign indications on the DVM.

50. Repeat steps 6 through 15 measuring the voltages on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

51. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

PITCH TVC MONITOR

52. Connect the Direct Probes to TB 4-28 (Hi) and 4-32 (Lo) on TPA #2 to monitor the Pitch TVC output.

TVC TEST

53. Repeat steps 25 through 41.

YAW (MG) CDU AC D/A MONITOR

54. Connect the Buffered Probes to TB 4-44 (Hi) and 4-48 (Lo) on TPA #2 to monitor the Yaw CDU AC Att Error.

55. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99.

ATTITUDE ERROR (FDAI) TEST

56. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

YAW (MG) CDU C/A MONITOR

57. Connect the Direct Probes to TB 4-35 (Hi) and 4-39 (Lo) on TPA #2 to monitor the Yaw CDU DC D/A output.

58. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

59. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

60. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

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61. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
NO ATT lamp goes out
d. Observe
Row 1 displays +00385
e. Observe
Row 2 displays -00385
f. Observe
Row 3 displays +00385

Record the voltage indication and sign.

62. Repeat steps 6 through 15 measuring the voltage on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurements in step 8.

TEST ABORT

63. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall not be lighted.

64. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
NO ATT lamp is not lighted.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12221
REV. E
INITIAL TDRR 29882

JOB SPACECRAFT CONTROL AND DISPLAY TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	Roll Att Error +00385	vac	+4.57		+5.57		
6	Roll Att Error +00384	vac	+4.56		+5.56		
7	Roll Att Error +00160	vac	+1.90		+2.32		
8	Roll Att Error +00135	vac	+1.60		+1.96		
	Roll Att Error Phase Angle	deg	-8.0		+8.0		
9	Roll Att Error +00090	vac	+1.07		+1.31		
10	Roll Att Error +00000	vac	-0.056		+0.056		
11	Roll Att Error -00090	vac	-1.07		-1.31		
12	Roll Att Error -00135	vac	-1.60		-1.96		

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FORM 06146
Chg. [illegible]-65

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JDC
NO. 12221
REV. E

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	Roll Att Error -00160	vac	-1.90		-2.32		
14	Roll Att Error -00384	vac	-4.56		-5.56		
15	Roll Att Error -00385	vac	-4.57		-5.57		
21	Roll S/C - Saturn +00385	vdc	+4.70		+5.44		
22 (6)	Roll S/C - Saturn +00384	vdc	+4.70		+5.43		
22 (7)	Roll S/C - Saturn +00160	vdc	+1.98		+2.24		
22 (8)	Roll S/C - Saturn +00135	vdc	+1.67		+1.89		
22 (9)	Roll S/C - Saturn +00090	vdc	+1.12		+1.26		
22 (10)	Roll S/C - Saturn +00000	vdc	-0.011		+0.01		
22 (11)	Roll S/C - Saturn -00090	vdc	-1.12		-1.26		
22 (12)	Roll S/C - Saturn -00135	vdc	-1.67		-1.89		
22 (13)	Roll S/C - Saturn -00160	vdc	-1.98		-2.24		
22 (14)	Roll S/C - Saturn -00384	vdc	-4.70		-5.43		
22 (15)	Roll S/C - Saturn -00385	vdc	-4.70		-5.44		

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JDC
NO. 12221
REV. E

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29	Yaw TVC +00385	vdc	+4.70		+5.44		
30	Yaw TVC +00384	vdc	+4.70		+5.44		
31	Yaw TVC +00160	vdc	+1.98		+2.24		
32	Yaw TVC +00135	vdc	+1.67		+1.89		
33	Yaw TVC +00090	vdc	+1.12		+1.26		
34	Yaw TVC +00000	vdc	-0.01		+0.01		
35	Yaw TVC -00090	vdc	-1.12		-1.26		
36	Yaw TVC -000135	vdc	-1.67		-1.89		
37	Yaw TVC -00160	vdc	-1.98		-2.24		
38	Yaw TVC -00384	vdc	-4.70		-5.43		
39	Yaw TVC -00385	vdc	-4.70		-5.44		
44 (5)	Pitch Att Error -00385	vac	-4.57		-5.57		
44 (6)	Pitch Att Error -00384	vac	-4.56		-5.56		
44 (7)	Pitch Att Error -00160	vac	-1.90		-2.32		

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JDC
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REV. E

JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
44 (8)	Pitch Att Error -00135	vac	-1.60		-1.96		
	Pitch Att Error Phase Angle	deg	+172.0		+188.0		
44 (9)	Pitch Att Error -00090	vac	-1.07		-1.31		
44 (10)	Pitch Att Error +00000	vac	-0.056		+0.056		
44 (11)	Pitch Att Error +00090	vac	+1.07		+1.31		
44 (12)	Pitch Att Error +00135	vac	+1.60		+1.96		
44 (13)	Pitch Att Error +00160	vac	+1.90		+2.32		
44 (14)	Pitch Att Error +00384	vac	+4.56		+5.56		
44 (15)	Pitch Att Error +00385	vac	+4.57		+5.57		
49	Pitch S/C - Saturn -00385	vdc	-4.70		-5.44		
50 (6)	Pitch S/C - Saturn -00384	vdc	-4.70		-5.43		
50 (7)	Pitch S/C - Saturn -00160	vdc	-1.98		-2.24		
50 (8)	Pitch S/C - Saturn -00135	vdc	-1.67		-1.89		
50 (9)	Pitch S/C - Saturn -00090	vdc	-1.12		-1.26		

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JDC
NO. 12221
REV. E

JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
50 (10)	Pitch S/C - Saturn -00000	vdc	-0.01		+0.01		
50 (11)	Pitch S/C - Saturn +00090	vdc	+1.12		+1.26		
50 (12)	Pitch S/C - Saturn +00135	vdc	+1.67		+1.89		
50 (13)	Pitch S/C - Saturn +00160	vdc	+1.98		+2.24		
50 (14)	Pitch S/C - Saturn +00384	vdc	+4.70		+5.43		
50 (15)	Pitch S/C - Saturn +00385	vdc	+4.70		+5.44		
53 (29)	Pitch TVC -00385	vdc	-4.70		-5.44		
53 (30)	Pitch TVC -00384	vdc	-4.70		-5.43		
53 (31)	Pitch TVC -00160	vdc	-1.98		-2.24		
53 (32)	Pitch TVC -00135	vdc	-1.67		-1.89		
53 (33)	Pitch TVC -00090	vdc	-1.12		-1.26		
53 (34)	Pitch TVC +00000	vdc	-0.01		+0.01		
53 (35)	Pitch TVC +00090	vdc	+1.12		+1.26		
53 (36)	Pitch TVC +00135	vdc	+1.67		+1.89		

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JDC
NO. 12221
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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53 (37)	Pitch TVC +00160	vdc	+1.98		+2.24		
53 (38)	Pitch TVC +00384	vdc	+4.70		+5.43		
53 (39)	Pitch TVC +00385	vdc	+4.70		+5.44		
56 (5)	Yaw Att Error +00385	vac	+4.57		+5.57		
56 (6)	Yaw Att Error +00384	vac	+4.56		+5.56		
56 (7)	Yaw Att Error +00160	vac	+1.90		+2.32		
56 (8)	Yaw Att Error +00135	vac	+1.60		+1.96		
	Yaw Att Error Phase Angle	deg	-8.0		+8.0		
56 (9)	Yaw Att Error +00090	vac	+1.07		+1.31		
56 (10)	Yaw Att Error -00090	vac	-1.07		-1.31		
56 (11)	Yaw Att Error -00135	vac	-1.60		-1.96		
56 (12)	Yaw Att Error -00160	vac	-1.90		-2.32		
56 (13)	Yaw Att Error -00384	vac	-4.56		-5.56		
56 (14)	Yaw Att Error -00385	vac	-4.57		-5.57		

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JDC
NO. 12221
REV. E

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
56 (15)	Yaw Att Error +00000	vac	-0.056		+0.056		
61	Yaw S/C - Saturn +00385	vdc	+4.70		+5.44		
62 (6)	Yaw S/C - Saturn +00384	vdc	+4.70		+5.43		
62 (7)	Yaw S/C - Saturn +00160	vdc	+1.98		+2.24		
62 (8)	Yaw S/C - Saturn +00135	vdc	+1.67		+1.89		
62 (9)	Yaw S/C - Saturn +00090	vdc	+1.12		+1.26		
62 (10)	Yaw S/C - Saturn -00090	vdc	-1.12		-1.26		
62 (11)	Yaw S/C - Saturn -00135	vdc	-1.67		-1.89		
62 (12)	Yaw S/C - Saturn -00160	vdc	-1.98		-2.24		
62 (13)	Yaw S/C - Saturn -00384	vdc	-4.70		-5.56		
62 (14)	Yaw S/C - Saturn -00385	vdc	-4.70		-5.57		
62 (15)	Yaw S/C - Saturn +00000	vdc	-0.01		+0.01		

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INITIAL TDRR 29882 D.S. PGS 7

SUBSYSTEM G & N SYSTEM | ASSY.
DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30310	All	2,4	EA	WS
B	11-3-66	31780	All	-	EA	
C	11-10-66	31899	4,5	-	EA	-
D	11-15-66	31945	1,6,7	7	EA	-
E	9-6-67	34560	1	-	EA	-
F	10-12-67	34830	1,4,5,8	-	EA	-

REFERENCES PS-2015000

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: DSKY displays specified in this JDC may in some cases be delayed approximately 15 seconds.

1. Perform JDC 12215 to establish a Master Initialization condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes to TB 4-43 (Hi) and 4-47 (Lo) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 199.

ATTITUDE ERROR (FDAI) TEST

4. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00013 ENTR
c. Observe
VERB 06 NOUN 01 Flashing
d. Observe
PROG lamp indicates 07
e. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

5. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

6. Enter VERB 33 into DSKY and press

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM 0[illegible]
Chg. 3-[illegible]

JOB SPACECRAFT DISPLAY AND CONTROL TEST | JDC 12221 REV F PAGE 2 OF 8

SUBSYSTEM G & N SYSTEM | ASSY

ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Row 3 displays +00384

Record the voltage indication and sign.

7. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160
d. Row 3 displays +00160

Record the voltage indication and sign.

8. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135
d. Row 3 displays +00135

Record the voltage indication and sign. Determine and record the phase angle of signal.

9. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090
d. Row 3 displays +00090

Record the voltage indication and sign.

10. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000
d. Row 3 displays -00090

Record the voltage indication and sign.

11. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090
d. Row 3 displays -00135

Record the voltage indication and sign.

12. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135
d. Row 3 displays -00160

Record the voltage indication and sign.

13. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays -00160

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JOB SPACECRAFT DISPLAY AND CONTROL TEST | JDC 12221 REV F PAGE 3 OF 8

SUBSYSTEM G & N SYSTEM | ASSY

c. Row 2 displays +00160
d. Row 3 displays -00384

Record the voltage indication and sign.

14. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384
d. Row 3 displays -00385

Record the voltage indication and sign.

15. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385
d. Row 3 displays +00000

Record the voltage indication and sign.

16. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

17. Connect the Direct Probes to TB4-34 (Hi) and 4-38 (Lo) on TPA #2 to monitor the Roll CDU DC D/A output.

18. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

19. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

20. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

21. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
Row 1 displays +00385
d. Observe
Row 2 displays -00385
e. Observe
Row 3 displays +00385
f. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

22. Repeat steps 6 through 15 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

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SUBSYSTEM G & N SYSTEM | ASSY

23. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

YAW TVC MONITOR

24. Connect the Direct Probes to TB 4-29 (Hi) and 4-33 (Lo) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

25. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

26. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

27. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 01 NOUN 10 Flashing
b. Row 1 displays X7373
c. Row 3 displays 00030

28. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 01 NOUN 10 Flashing
c. Observe
Row 1 displays 37777
d. Observe
Row 3 displays 00031

29. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 03 Flashing
c. Observe
Row 1 displays +00385
d. Observe
Row 2 displays -00385
e. Observe
Row 3 displays +00003

Record the voltage indication and sign.

NOTE: Row 3 shall display +00003 until completion of step 39.

30. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

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31. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160

Record the voltage and sign indications on the DVM.

32. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135

Record the voltage indication and sign.

33. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090

Record the voltage indication and sign. Set the OPTICS SPEED switch on the Indicator Control panel to HI.

34. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000

While holding the Optics Hand Controller up and left (45°) no longer than 10 seconds, record the voltage indication and sign.

35. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090

Record the voltage indication and sign. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

36. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135

Record the voltage indication and sign.

37. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160

Record the voltage indicator and sign.

38. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

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b. Row 1 displays -00384
c. Row 2 displays +00384

Record the voltage indication and sign.

39. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385

Record the voltage indication and sign.

TEST ABORT AND RESTART

40. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00
c. VERB 57 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 00013 ENTR
f. Observe
VERB 06 NOUN 01 Flashing
g. Observe
NO ATT lamp lights
h. Observe
PROG lamp indicates 07

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

41. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall not be lighted.

PITCH (IG) CDU AC D/A MONITOR

42. Connect the Buffered Probes to TB 4-45 (Hi) and 4-49 (Lo) on TPA #2 to monitor the Pitch CDU AC Att Error.

43. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 99.

ATTITUDE ERROR (FDAI) TEST

44. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

PITCH (IG) CDU DC D/A MONITOR

45. Connect the Direct Probes to TB 4-36 (Hi) and 4-40 (Lo) on TPA #2 to monitor the Pitch CDU DC D/A output.

46. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

47. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

48. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

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49. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
NO ATT lamp goes out
d. Observe
Row 1 displays +00385
e. Observe
Row 2 displays -00385
f. Observe
Row 3 displays +00385

Record the voltage and sign indications on the DVM.

50. Repeat steps 6 through 15 measuring the voltages on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

51. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

PITCH TVC MONITOR

52. Connect the Direct Probes to TB 4-28 (Hi) and 4-32 (Lo) on TPA #2 to monitor the Pitch TVC output.

TVC TEST

53. Repeat steps 25 through 41.

YAW (MG) CDU AC D/A MONITOR

54. Connect the Buffered Probes to TB 4-44 (Hi) and 4-48 (Lo) on TPA #2 to monitor the Yaw CDU AC Att Error.

55. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99.

ATTITUDE ERROR (FDAI) TEST

56. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

YAW (MG) CDU C/A MONITOR

57. Connect the Direct Probes to TB 4-35 (Hi) and 4-39 (Lo) on TPA #2 to monitor the Yaw CDU DC D/A output.

58. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

59. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

60. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

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61. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
NO ATT lamp goes out
d. Observe
Row 1 displays +00385
e. Observe
Row 2 displays -00385
f. Observe
Row 3 displays +00385

Record the voltage indication and sign.

62. Repeat steps 6 through 15 measuring the voltage on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurements in step 8.

TEST ABORT

63. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall not be lighted.

64. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
NO ATT lamp is not lighted.

65. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12221
REV. F
INITIAL TDRR 29832

JOB SPACECRAFT CONTROL AND DISPLAY TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL. DATE

NAME ______ SER. NO. ______ CAL. DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	Roll Att Error +00385	vac	+4.57		+5.57		
6	Roll Att Error +00384	vac	+4.56		+5.56		
7	Roll Att Error +00160	vac	+1.90		+2.32		
8	Roll Att Error +00135	vac	+1.60		+1.96		
	Roll Att Error Phase Angle	deg	-8.0		+8.0		
9	Roll Att Error +00090	vac	+1.07		+1.31		
10	Roll Att Error +00000	vac	-0.056		+0.056		
11	Roll Att Error -00090	vac	-1.07		-1.31		
12	Roll Att Error -00135	vac	-1.60		-1.96		

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FORM 00146
Chg. 7-23-65

APOLLO G&N
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JDC
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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	Roll Att Error -00160	vac	-1.90		-2.32		
14	Roll Att Error -00384	vac	-4.56		-5.56		
15	Roll Att Error -00385	vac	-4.57		-5.57		
21	Roll S/C - Saturn +00385	vdc	+4.70		+5.44		
22 (6)	Roll S/C - Saturn +00384	vdc	+4.70		+5.43		
22 (7)	Roll S/C - Saturn +00160	vdc	+1.98		+2.24		
22 (8)	Roll S/C - Saturn +00135	vdc	+1.67		+1.89		
22 (9)	Roll S/C - Saturn +00090	vdc	+1.12		+1.26		
22 (10)	Roll S/C - Saturn +00000	vdc	-0.011		+0.01		
22 (11)	Roll S/C - Saturn -00090	vdc	-1.12		-1.26		
22 (12)	Roll S/C - Saturn -00135	vdc	-1.67		-1.89		
22 (13)	Roll S/C - Saturn -00160	vdc	-1.98		-2.24		
22 (14)	Roll S/C - Saturn -00384	vdc	-4.70		-5.43		
22 (15)	Roll S/C - Saturn -00385	vdc	-4.70		-5.44		

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JDC
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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29	Yaw TVC +00385	vdc	+4.70		+5.44		
30	Yaw TVC +00384	vdc	+4.70		+5.44		
31	Yaw TVC +00160	vdc	+1.98		+2.24		
32	Yaw TVC +00135	vdc	+1.67		+1.89		
33	Yaw TVC +00090	vdc	+1.12		+1.26		
34	Yaw TVC +00000	vdc	-0.01		+0.01		
35	Yaw TVC -00090	vdc	-1.12		-1.26		
36	Yaw TVC -000135	vdc	-1.67		-1.89		
37	Yaw TVC -00160	vdc	-1.98		-2.24		
38	Yaw TVC -00384	vdc	-4.70		-5.43		
39	Yaw TVC -00385	vdc	-4.70		-5.44		
44 (5)	Pitch Att Error -00385	vac	-4.57		-5.57		
44 (6)	Pitch Att Error -00384	vac	-4.56		-5.56		
44 (7)	Pitch Att Error -00160	vac	-1.90		-2.32		

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JDC
NO. 12221
REV. F

JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
44 (8)	Pitch Att Error -00135	vac	-1.60		-1.96		
	Pitch Att Error Phase Angle	deg	+172.0		+188.0		
44 (9)	Pitch Att Error -00090	vac	-1.07		-1.31		
44 (10)	Pitch Att Error +00000	vac	-0.056		+0.056		
44 (11)	Pitch Att Error +00090	vac	+1.07		+1.31		
44 (12)	Pitch Att Error +00135	vac	+1.60		+1.96		
44 (13)	Pitch Att Error +00160	vac	+1.90		+2.32		
44 (14)	Pitch Att Error +00384	vac	+4.56		+5.56		
44 (15)	Pitch Att Error +00385	vac	+4.57		+5.57		
49	Pitch S/C - Saturn -00385	vdc	-4.70		-5.44		
50 (6)	Pitch S/C - Saturn -00384	vdc	-4.70		-5.43		
50 (7)	Pitch S/C - Saturn -00160	vdc	-1.98		-2.24		
50 (8)	Pitch S/C - Saturn -00135	vdc	-1.67		-1.89		
50 (9)	Pitch S/C - Saturn -00090	vdc	-1.12		-1.26		

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JDC
NO. 12221
REV. F

JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
50 (10)	Pitch S/C - Saturn -00000	vdc	-0.01		+0.01		
50 (11)	Pitch S/C - Saturn +00090	vdc	+1.12		+1.26		
50 (12)	Pitch S/C - Saturn +00135	vdc	+1.67		+1.89		
50 (13)	Pitch S/C - Saturn +00160	vdc	+1.98		+2.24		
50 (14)	Pitch S/C - Saturn +00384	vdc	+4.70		+5.43		
50 (15)	Pitch S/C - Saturn +00385	vdc	+4.70		+5.44		
53 (29)	Pitch TVC -00385	vdc	-4.70		-5.44		
53 (30)	Pitch TVC -00384	vdc	-4.70		-5.43		
53 (31)	Pitch TVC -00160	vdc	-1.98		-2.24		
53 (32)	Pitch TVC -00135	vdc	-1.67		-1.89		
53 (33)	Pitch TVC -00090	vdc	-1.12		-1.26		
53 (34)	Pitch TVC +00000	vdc	-0.01		+0.01		
53 (35)	Pitch TVC +00090	vdc	+1.12		+1.26		
53 (36)	Pitch TVC +00135	vdc	+1.67		+1.89		

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JDC
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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53 (37)	Pitch TVC +00160	vdc	+1.98		+2.24		
53 (38)	Pitch TVC +00384	vdc	+4.70		+5.43		
53 (39)	Pitch TVC +00385	vdc	+4.70		+5.44		
56 (5)	Yaw Att Error +00385	vac	+4.57		+5.57		
56 (6)	Yaw Att Error +00384	vac	+4.56		+5.56		
56 (7)	Yaw Att Error +00160	vac	+1.90		+2.32		
56 (8)	Yaw Att Error +00135	vac	+1.60		+1.96		
	Yaw Att Error Phase Angle	deg	-8.0		+8.0		
56 (9)	Yaw Att Error +00090	vac	+1.07		+1.31		
56 (10)	Yaw Att Error -00090	vac	-1.07		-1.31		
56 (11)	Yaw Att Error -00135	vac	-1.60		-1.96		
56 (12)	Yaw Att Error -00160	vac	-1.90		-2.32		
56 (13)	Yaw Att Error -00384	vac	-4.56		-5.56		
56 (14)	Yaw Att Error -00385	vac	-4.57		-5.57		

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JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
56 (15)	Yaw Att Error +00000	vac	-0.056		+0.056		
61	Yaw S/C - Saturn +00385	vdc	+4.70		+5.44		
62 (6)	Yaw S/C - Saturn +00384	vdc	+4.70		+5.43		
62 (7)	Yaw S/C - Saturn +00160	vdc	+1.98		+2.24		
62 (8)	Yaw S/C - Saturn +00135	vdc	+1.67		+1.89		
62 (9)	Yaw S/C - Saturn +00090	vdc	+1.12		+1.26		
62 (10)	Yaw S/C - Saturn -00090	vdc	-1.12		-1.26		
62 (11)	Yaw S/C - Saturn -00135	vdc	-1.67		-1.89		
62 (12)	Yaw S/C - Saturn -00160	vdc	-1.98		-2.24		
62 (13)	Yaw S/C - Saturn -00384	vdc	-4.70		-5.56		
62 (14)	Yaw S/C - Saturn -00385	vdc	-4.70		-5.57		
62 (15)	Yaw S/C - Saturn +00000	vdc	-0.01		+0.01		

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV. G PAGE 1 OF 8

INITIAL TDRR 29882 D.S. PGS 7

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30310	All	2,4	EA	WS
B	11-3-66	31780	All	-	EA	
C	11-10-66	31899	4,5	-	EA	-
D	11-15-66	31945	1,6,7	7	EA	-
E	9-6-67	34560	1	-	EA	-
F	10-12-67	34830	1,4,5,8	-	EA	-
G	2-2-68	35557	1,4,8	-	EA	-

REFERENCES PS-2015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CMC test connector before proceeding with this JDC. 2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

NOTE: DSKY displays specified in this JDC may in some cases be delayed approximately 15 seconds.

1. Perform JDC 12215 to establish a Master Initialization condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes to TB 4-43 (Hi) and 4-47 (Lo) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 199.

ATTITUDE ERROR (FDAI) TEST

4. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00013 ENTR

c. Observe
VERB 06 NOUN 01 Flashing

d. Observe
PROG lamp indicates 07

e. Observe
NO ATT lamp lights

VERIFICATION WITH SIDL REQUIRED BEFORE USE

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

5. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00385

c. Row 2 displays -00385

d. Row 3 displays +00385

e. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

6. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00384

c. Row 2 displays -00384

d. Row 3 displays +00384

Record the voltage indication and sign.

7. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00160

c. Row 2 displays -00160

d. Row 3 displays +00160

Record the voltage indication and sign.

8. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00135

d. Row 2 displays -00135

d. Row 3 displays +00135

Record the voltage indication and sign. Determine and record the phase angle of signal.

9. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00090

c. Row 2 displays -00090

d. Row 3 displays +00090

Record the voltage indication and sign.

10. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays +00000

c. Row 2 displays +00000

d. Row 3 displays -00090

Record the voltage indication and sign.

11. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00090

c. Row 2 displays +00090

d. Row 3 displays -00135

Record the voltage indication and sign.

---

12. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00135

c. Row 2 displays +00135

d. Row 3 displays -00160

Record the voltage indication and sign.

13. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00160

c. Row 2 displays +00160

d. Row 3 displays -00384

Record the voltage indication and sign.

14. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00384

c. Row 2 displays +00384

d. Row 3 displays -00385

Record the voltage indication and sign.

15. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 01 Flashing

b. Row 1 displays -00385

c. Row 2 displays +00385

d. Row 3 displays +00000

Record the voltage indication and sign.

16. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

17. Connect the Direct Probes to TB4-34 (Hi) and 4-38 (Lo) on TPA #2 to monitor the Roll CDU DC D/A output.

18. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

19. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing

b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

20. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing

b. Row 1 displays X6377

c. Row 3 displays 00030

21. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 06 NOUN 02 Flashing

c. Observe
Row 1 displays +00385

---

d. Observe
Row 2 displays -00385

e. Observe
Row 3 displays +00385

f. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

22. Repeat steps 6 through 15 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

23. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing

b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

YAW TVC MONITOR

24. Connect the Direct Probes to TB 4-29 (Hi) and 4-33 (Lo) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

25. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

NOTE: If AGC ALARMS indicator 2 lights on Logic Drawer No. 1 of CTS, press ALARM RESET pushbutton on Programmer and Monitor panel.

26. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

27. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 01 NOUN 10 Flashing

b. Row 1 displays X7373

c. Row 3 displays 00030

28. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 01 NOUN 10 Flashing

c. Observe
Row 1 displays 37777

d. Observe
Row 3 displays 00031

29. Perform the following DSKY operations:

a. VERB 33 ENTR

b. Observe
VERB 06 NOUN 03 Flashing

c. Observe
Row 1 displays +00385

d. Observe
Row 2 displays -00385

e. Observe
Row 3 displays +00003

Record the voltage indication and sign.

NOTE: Row 3 shall display +00003 until completion of step 39.

30. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Observe
NO ATT lamp goes out

Record the voltage indication and sign.

31. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160

Record the voltage and sign indications on the DVM.

32. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135

Record the voltage indication and sign.

33. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090

Record the voltage indication and sign. Set the OPTICS SPEED switch on the Indicator Control panel to HI.

34. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000

While holding the Optics Hand Controller up and left (45°) no longer than 10 seconds, record the voltage indication and sign.

35. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090

Record the voltage indication and sign. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

36. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00135

c. Row 2 displays +00135

Record the voltage indication and sign.

37. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160

Record the voltage indicator and sign.

38. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384

Record the voltage indication and sign.

39. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385

Record the voltage indication and sign.

TEST ABORT AND RESTART

40. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
PROG lamp indicates 00
c. VERB 57 ENTR
d. Observe
VERB 21 NOUN 01 Flashing
e. 00013 ENTR
f. Observe
VERB 06 NOUN 01 Flashing
g. Observe
NO ATT lamp lights
h. Observe
PROG lamp indicates 07

Observe the Gimbal Angles, approximately 0^{c}, are displayed on Row 1, Row 2 and Row 3.

41. Press CH30-3/IN0-3 pushbutton on the RDC interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall not be lighted.

PITCH (IG) CDU AC D/A MONITOR

42. Connect the Buffered Probes to TB 4-45 (Hi) and 4-49 (Lo) on TPA #2 to monitor the Pitch CDU AC Att Error.

43. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector to 99.

ATTITUDE ERROR (FDAI) TEST

44. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

PITCH (IG) CDU DC D/A MONITOR

45. Connect the Direct Probes to TB 4-36 (Hi) and 4-40 (Lo) on TPA #2 to monitor the Pitch CDU DC D/A output.

46. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

47. Enter VERB 33 into DSKY and press

ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

48. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

49. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
NO ATT lamp goes out
d. Observe
Row 1 displays +00385
e. Observe
Row 2 displays -00385
f. Observe
Row 3 displays +00385

Record the voltage and sign indications on the DVM.

50. Repeat steps 6 through 15 measuring the voltages on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurement in step 8.

51. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 03 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

PITCH TVC MONITOR

52. Connect the Direct Probes to TB 4-28 (Hi) and 4-32 (Lo) on TPA #2 to monitor the Pitch TVC output.

TVC TEST

53. Repeat steps 25 through 41.

YAW (MG) CDU AC D/A MONITOR

54. Connect the Buffered Probes to TB 4-44 (Hi) and 4-48 (Lo) on TPA #2 to monitor the Yaw CDU AC Att Error.

55. Set the VOLTMETER INPUT switch to PAVM SIG 1 and the CROSSBAR CONTROL on the Primary Signal Selector panel to 99.

ATTITUDE ERROR (FDAI) TEST

56. Repeat steps 5 through 16. Determine and record the phase angle of signal in step 8.

YAW (MG) CDU C/A MONITOR

57. Connect the Direct Probes to TB 4-35 (Hi) and 4-39 (Lo) on TPA #2 to monitor the Yaw CDU DC D/A output.

58. Set the VOLTMETER INPUT switch to DVM SIG 2 and the CROSSBAR CONTROL on the Primary Signal Selector to 99. Set the FUNCTION selector on the Digital Voltmeter panel to DC VOLTS.

S/C CONTROL OF SATURN TEST

59. Enter VERB 33 into DSKY and press

ENTR pushbutton. Observe the DSKY displays the following:

a. Observe
VERB 06 NOUN 02 Flashing
b. Observe
NO ATT lamp lights

Observe the Gimbal Angles, approximately 0°, are displayed on Row 1, Row 2 and Row 3.

60. Enter VERB 33 into DSKY and press ENTR pushbutton. Observe the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

61. Perform the following DSKY operations:

a. VERB 33 ENTR
b. Observe
VERB 06 NOUN 02 Flashing
c. Observe
NO ATT lamp goes out
d. Observe
Row 1 displays +00385
e. Observe
Row 2 displays -00385
f. Observe
Row 3 displays +00385

Record the voltage indication and sign.

62. Repeat steps 6 through 15 measuring the voltage on DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash during performance of those steps. Exclude phase angle measurements in step 8.

TEST ABORT

63. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall not be lighted.

64. Perform the following DSKY operations:

a. VERB 34 ENTR
b. Observe
NO ATT lamp is not lighted.

NOTE: If AGC ALARMS indicator 2 lights on Logic Drawer No. 1 of CTS, press ALARM RESET pushbutton on Programmer and Monitor panel.

65. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12221
REV. G
INITIAL TDRR 29882

JOB SPACECRAFT CONTROL AND DISPLAY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5	Roll Att Error +00385	vac	+4.57		+5.57		
6	Roll Att Error +00384	vac	+4.56		+5.56		
7	Roll Att Error +00160	vac	+1.90		+2.32		
8	Roll Att Error +00135	vac	+1.60		+1.96		
	Roll Att Error Phase Angle	deg	-8.0		+8.0		
9	Roll Att Error +00090	vac	+1.07		+1.31		
10	Roll Att Error +00000	vac	-0.056		+0.056		
11	Roll Att Error -00090	vac	-1.07		-1.31		
12	Roll Att Error -00135	vac	-1.60		-1.96		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12221
REV. G

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
13	Roll Att Error -00160	vac	-1.90		-2.32		
14	Roll Att Error -00384	vac	-4.56		-5.56		
15	Roll Att Error -00385	vac	-4.57		-5.57		
21	Roll S/C - Saturn +00385	vdc	+4.70		+5.44		
22 (6)	Roll S/C - Saturn +00384	vdc	+4.70		+5.43		
22 (7)	Roll S/C - Saturn +00160	vdc	+1.98		+2.24		
22 (8)	Roll S/C - Saturn +00135	vdc	+1.67		+1.89		
22 (9)	Roll S/C - Saturn +00090	vdc	+1.12		+1.26		
22 (10)	Roll S/C - Saturn +00000	vdc	-0.011		+0.01		
22 (11)	Roll S/C - Saturn -00090	vdc	-1.12		-1.26		
22 (12)	Roll S/C - Saturn -00135	vdc	-1.67		-1.89		
22 (13)	Roll S/C - Saturn -00160	vdc	-1.98		-2.24		
22 (14)	Roll S/C - Saturn -00384	vdc	-4.70		-5.43		
22 (15)	Roll S/C - Saturn -00385	vdc	-4.70		-5.44		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12221
REV. G

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29	Yaw TVC +00385	vdc	+4.70		+5.44		
30	Yaw TVC +00384	vdc	+4.70		+5.44		
31	Yaw TVC +00160	vdc	+1.98		+2.24		
32	Yaw TVC +00135	vdc	+1.67		+1.89		
33	Yaw TVC +00090	vdc	+1.12		+1.26		
34	Yaw TVC +00000	vdc	-0.01		+0.01		
35	Yaw TVC -00090	vdc	-1.12		-1.26		
36	Yaw TVC -000135	vdc	-1.67		-1.89		
37	Yaw TVC -00160	vdc	-1.98		-2.24		
38	Yaw TVC -00384	vdc	-4.70		-5.43		
39	Yaw TVC -00385	vdc	-4.70		-5.44		
44 (5)	Pitch Att Error -00385	vac	-4.57		-5.57		
44 (6)	Pitch Att Error -00384	vac	-4.56		-5.56		
44 (7)	Pitch Att Error -00160	vac	-1.90		-2.32		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12221
REV. G

JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
44 (8)	Pitch Att Error -00135	vac	-1.60		-1.96		
	Pitch Att Error Phase Angle	deg	+172.0		+188.0		
44 (9)	Pitch Att Error -00090	vac	-1.07		-1.31		
44 (10)	Pitch Att Error +00000	vac	-0.056		+0.056		
44 (11)	Pitch Att Error +00090	vac	+1.07		+1.31		
44 (12)	Pitch Att Error +00135	vac	+1.60		+1.96		
44 (13)	Pitch Att Error +00160	vac	+1.90		+2.32		
44 (14)	Pitch Att Error +00384	vac	+4.56		+5.56		
44 (15)	Pitch Att Error +00385	vac	+4.57		+5.57		
49	Pitch S/C - Saturn -00385	vdc	-4.70		-5.44		
50 (6)	Pitch S/C - Saturn -00384	vdc	-4.70		-5.43		
50 (7)	Pitch S/C - Saturn -00160	vdc	-1.98		-2.24		
50 (8)	Pitch S/C - Saturn -00135	vdc	-1.67		-1.89		
50 (9)	Pitch S/C - Saturn -00090	vdc	-1.12		-1.26		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 **OF** 7

JDC
NO. 12221
REV. G

JOB SPACECRAFT CONTROL AND DISPLAY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
50 (10)	Pitch S/C - Saturn -00000	vdc	-0.01		+0.01		
50 (11)	Pitch S/C - Saturn +00090	vdc	+1.12		+1.26		
50 (12)	Pitch S/C - Saturn +00135	vdc	+1.67		+1.89		
50 (13)	Pitch S/C - Saturn +00160	vdc	+1.98		+2.24		
50 (14)	Pitch S/C - Saturn +00384	vdc	+4.70		+5.43		
50 (15)	Pitch S/C - Saturn +00385	vdc	+4.70		+5.44		
53 (29)	Pitch TVC -00385	vdc	-4.70		-5.44		
53 (30)	Pitch TVC -00384	vdc	-4.70		-5.43		
53 (31)	Pitch TVC -00160	vdc	-1.98		-2.24		
53 (32)	Pitch TVC -00135	vdc	-1.67		-1.89		
53 (33)	Pitch TVC -00090	vdc	-1.12		-1.26		
53 (34)	Pitch TVC +00000	vdc	-0.01		+0.01		
53 (35)	Pitch TVC +00090	vdc	+1.12		+1.26		
53 (36)	Pitch TVC +00135	vdc	+1.67		+1.89		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 **OF** 7

JDC
NO. 12221
REV. G

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53 (37)	Pitch TVC +00160	vdc	+1.98		+2.24		
53 (38)	Pitch TVC +00384	vdc	+4.70		+5.43		
53 (39)	Pitch TVC +00385	vdc	+4.70		+5.44		
56 (5)	Yaw Att Error +00385	vac	+4.57		+5.57		
56 (6)	Yaw Att Error +00384	vac	+4.56		+5.56		
56 (7)	Yaw Att Error +00160	vac	+1.90		+2.32		
56 (8)	Yaw Att Error +00135	vac	+1.60		+1.96		
	Yaw Att Error Phase Angle	deg	-8.0		+8.0		
56 (9)	Yaw Att Error +00090	vac	+1.07		+1.31		
56 (10)	Yaw Att Error -00090	vac	-1.07		-1.31		
56 (11)	Yaw Att Error -00135	vac	-1.60		-1.96		
56 (12)	Yaw Att Error -00160	vac	-1.90		-2.32		
56 (13)	Yaw Att Error -00384	vac	-4.56		-5.56		
56 (14)	Yaw Att Error -00385	vac	-4.57		-5.57		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 7

JDC
NO. 12221
REV. G

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
56 (15)	Yaw Att Error +00000	vac	-0.056		+0.056		
61	Yaw S/C - Saturn +00385	vdc	+4.70		+5.44		
62 (6)	Yaw S/C - Saturn +00384	vdc	+4.70		+5.43		
62 (7)	Yaw S/C - Saturn +00160	vdc	+1.98		+2.24		
62 (8)	Yaw S/C - Saturn +00135	vdc	+1.67		+1.89		
62 (9)	Yaw S/C - Saturn +00090	vdc	+1.12		+1.26		
62 (10)	Yaw S/C - Saturn -00090	vdc	-1.12		-1.26		
62 (11)	Yaw S/C - Saturn -00135	vdc	-1.67		-1.89		
62 (12)	Yaw S/C - Saturn -00160	vdc	-1.98		-2.24		
62 (13)	Yaw S/C - Saturn -00384	vdc	-4.70		-5.56		
62 (14)	Yaw S/C - Saturn -00385	vdc	-4.70		-5.57		
62 (15)	Yaw S/C - Saturn +00000	vdc	-0.01		+0.01		

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV. J PAGE 1 OF 21

INITIAL TDRR 29882 D.S. PGS 7

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION During this test the CGC issues bit commands to the IMU/CDU DAC's resulting in specified ac total and phase outputs and dc voltage outputs of the Pitch, Roll, and Yaw Attitude Error signals. The CGC also issues bit commands to the Optics CDU DAC's resulting in specified dc voltage outputs of the Pitch and Yaw SPS Engine Steering signals.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
M A	7-28-66	30310	All	2,4	EA	WS
B	11-3-66	31780	All	-	EA	
M C	11-10-66	31899	4,5	-	EA	-
M D	11-15-66	31945	1,6,7	7	EA	-
M E	9-6-67	34560	1	-	EA	-
M F	10-12-67	34830	1,4,5,8	-	EA	-
M G	2-2-68	35557	1,4,8	-	EA	-
M H	5-29-68	36277	All	All	EA	-
J	12-3-68	37084	3,21	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC.

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the CGC test connector before proceeding with this JDC.

2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

NOTE: DSKY displays specified in this JDC may in some cases be delayed approximately 15 seconds.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedure contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:

None

1. Perform JDC 12215 to establish a Master Initialization condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes on TPA #2 to TB4-43 (high) and TB4-47 (low) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT switch on the Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

4. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 800 ~ #2.

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:

JDC 12221 CTS UPLINK
Tape, P/N 2901627-001

1. Perform JDC 12215 to establish a Master Initialization condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes on TPA #2 to TB4-43 (high) and TB4-47 (low) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT switch on the Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

4. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 800 ~ #2.

4A. Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) XY Interface panel -
Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

(B) Programmer and Monitor panel -
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(C) Logic Drawer No. 2 -
Set AGREEMENT B digitswitches to X01X3070. Set AGREEMENT B switch to STOP.

(D) RDC Interface panel -
Press to light CH33-10 pushbutton.

(E) Tape Reader -
Set Power switch to ON. If alarms occur, press PROCEED and ALARM

MANUAL LOAD PROCEDURES

5. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 30067 ENTR
d. NOUN 15 ENTR
e. 43662 ENTR ENTR
f. 61426 ENTR ENTR
g. 10000 ENTR ENTR
h. 01300 ENTR ENTR
i. 00033 ENTR ENTR
j. 01300 ENTR ENTR
k. 43663 ENTR ENTR
l. 61426 ENTR ENTR
m. 10000 ENTR ENTR
n. 01307 ENTR ENTR
o. 37633 ENTR ENTR
p. 01307 ENTR ENTR
q. 31313 ENTR ENTR
r. 54026 ENTR ENTR
s. 54027 ENTR ENTR

CTS UPLINK TAPE LOAD PROCEDURES

RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

(F) Load the CTS UPLINK tape in the Tape Reader.

(G) Programmer and Monitor panel -
Press EXECUTE pushbutton.

(H) Verify that the tape advances to the beginning of the first UPLINK code.

(I) Programmer and Monitor panel -
Press EXECUTE pushbutton.

(J) Verify that AGREEMENT B lamp on Logic Drawer No. 2 is not lighted.

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: The UPLINK ACTY lamp on the DSKY will light during performance of this test.

MANUAL LOAD PROCEDURES

t. 04317 ENTR ENTR
u. 10067 ENTR ENTR
v. 01324 ENTR ENTR
w. 01321 ENTR ENTR
x. 41305 ENTR ENTR
y. 60266 ENTR ENTR
z. 10000 ENTR ENTR
aa. 01320 ENTR ENTR
ab. 00000 ENTR ENTR
ac. 01320 ENTR ENTR
ad. 01300 ENTR
ae. VERB 01 NOUN 01 ENTR
af. 01300 ENTR

6. Observe that Row 1 on the DSKY indicates 30067.

7. Enter NOUN 15 and press the ENTR pushbutton on the DSKY.

8. Observe that Row 1 on the DSKY indicates 43662.

9. Press the ENTR pushbutton on the DSKY for each test listed below. For each test, observe that the DSKY Row 1 indicates as specified:

Test	DSKY Row 1 Indication
a.	61426
b.	10000
c.	01300
d.	00033
e.	01300
f.	43663

CTS UPLINK TAPE LOAD PROCEDURES

6. Observe that Row 1 on the DSKY indicates 30067.

7. Press EXECUTE pushbutton on Programmer and Monitor panel.

8. Observe that Row 1 on the DSKY indicates 43662.

9. Press the EXECUTE pushbutton on the Programmer and Monitor panel for each test listed below. For each test, observe that the DSKY Row 1 indicates as specified:

Test	DSKY Row 1 Indication
a.	61426
b.	10000
c.	01300
d.	00033
e.	01300
f.	43663

MANUAL LOAD PROCEDURES

Test	DSKY Row 1 Indication
g.	61426
h.	10000
i.	01307
j.	37633
k.	01307
l.	31313
m.	54026
n.	54027
o.	04317
p.	10067
q.	01324
r.	01321
s.	41305
t.	60266
u.	10000
v.	01320
w.	00000
x.	01320
y.	01300

10. Perform following DSKY operations:
a. VERB 25 NOUN 26 ENTR
b. 02000 ENTR
c. 01321 ENTR
d. 12007 ENTR

11. Observe that Row 1, Row 2, and Row 3 on the DSKY indicate as follows:
a. Row 1 displays 02000
b. Row 2 displays 01321
c. Row 3 displays 12007

CTS UPLINK TAPE LOAD PROCEDURES

Test	DSKY Row 1 Indication
g.	61426
h.	10000
i.	01307
j.	37633
k.	01307
l.	31313
m.	54026
n.	54027
o.	04317
p.	10067
q.	01324
r.	01321
s.	41305
t.	60266
u.	10000
v.	01320
w.	00000
x.	01320
y.	01300

10. Press EXECUTE pushbutton on Programmer and Monitor panel.

11. Observe that Row 1, Row 2, and Row 3 on the DSKY indicate as follows:
a. Row 1 displays 02000
b. Row 2 displays 01321
c. Row 3 displays 12007

MANUAL LOAD PROCEDURES

12. Enter VERB 30 and press ENTR pushbutton on the DSKY.

13. Perform following DSKY operations:
a. VERB 57 ENTR
b. 00013 ENTR

14. Observe that the DSKY displays the following:
a. PROG displays 07
b. VERB 06 NOUN 01 Flashing
c. NO ATT lamp lights
d. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

15. Enter VERB 33 and press ENTR pushbutton on the DSKY.

16. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. NO ATT lamp goes out.

Record the PAVM voltage indication and sign.

17. Enter VERB 33 and press ENTR pushbutton on the DSKY.

18. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Row 3 displays +00384

Record the PAVM voltage indication and sign.

CTS UPLINK TAPE LOAD PROCEDURES

12. Press EXECUTE pushbutton on Programmer and Monitor panel.

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

14. Observe that the DSKY displays the following:
a. PROG displays 07
b. VERB 06 NOUN 01 Flashing
c. NO ATT lamp lights
d. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

15. Press EXECUTE pushbutton on Programmer and Monitor panel.

16. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. NO ATT lamp goes out.

Record the PAVM voltage indication and sign.

17. Press EXECUTE pushbutton on Programmer and Monitor panel.

18. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Row 3 displays +00384

Record the PAVM voltage indication and sign.

MANUAL LOAD PROCEDURES

19. Enter VERB 33 and press ENTR pushbutton on the DSKY.

20. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160
d. Row 3 displays +00160

Record the PAVM voltage indication and sign.

21. Enter VERB 33 and press ENTR pushbutton on the DSKY.

22. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135
d. Row 3 displays +00135

Record the PAVM voltage indication and sign. Determine and record the phase angle of the signal.

23. Enter VERB 33 and press ENTR pushbutton on the DSKY.

24. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090
d. Row 3 displays +00090

Record the PAVM voltage indication and sign.

25. Enter VERB 33 and press ENTR pushbutton on the DSKY.

26. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing

CTS UPLINK TAPE LOAD PROCEDURES

19. Press EXECUTE pushbutton on Programmer and Monitor panel.

20. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160
d. Row 3 displays +00160

Record the PAVM voltage indication and sign.

21. Press EXECUTE pushbutton on Programmer and Monitor panel.

22. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135
d. Row 3 displays +00135

Record the PAVM voltage indication and sign. Determine and record the phase angle of the signal.

23. Press EXECUTE pushbutton on Programmer and Monitor panel.

24. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090
d. Row 3 displays +00090

Record the PAVM voltage indication and sign.

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

26. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing

MANUAL LOAD PROCEDURES

b. Row 1 displays +00000
c. Row 2 displays +00000
d. Row 3 displays -00090

Record the PAVM voltage indication and sign.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090
d. Row 3 displays -00135

Record the PAVM voltage indication and sign.

29. Enter VERB 33 and press ENTR pushbutton on the DSKY.

30. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135
d. Row 3 displays -00160

Record the PAVM voltage indication and sign.

31. Enter VERB 33 and press ENTR pushbutton on the DSKY.

32. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160
d. Row 3 displays -00384

Record the PAVM voltage indication and sign.

CTS UPLINK TAPE LOAD PROCEDURES

b. Row 1 displays +00000
c. Row 2 displays +00000
d. Row 3 displays -00090

Record the PAVM voltage indication and sign.

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

28. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090
d. Row 3 displays -00135

Record the PAVM voltage indication and sign.

29. Press EXECUTE pushbutton on Programmer and Monitor panel.

30. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135
d. Row 3 displays -00160

Record the PAVM voltage indication and sign.

31. Press EXECUTE pushbutton on Programmer and Monitor panel.

32. Observe that the DSKY displays the following:
a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160
d. Row 3 displays -00384

Record the PAVM voltage indication and sign.

MANUAL LOAD PROCEDURES

33. Enter VERB 33 and press ENTR pushbutton on the DSKY.

34. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384
d. Row 3 displays -00385

Record the PAVM voltage indication and sign.

35. Enter VERB 33 and press ENTR pushbutton on the DSKY.

36. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385
d. Row 3 displays +00000

Record the PAVM voltage indication and sign.

37. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

38. Connect the Direct Probes to TB4-34 (high) and TB4-38 (low) on TPA #2 to monitor the Roll CDU DC D/A output.

39. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and set the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the Digital Voltmeter (DVM) to DC VOLTS.

S/C CONTROL OF SATURN TEST

40. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

34. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384
d. Row 3 displays -00385

Record the PAVM voltage indication and sign.

35. Press EXECUTE pushbutton on Programmer and Monitor panel.

36. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385
d. Row 3 displays +00000

Record the PAVM voltage indication and sign.

37. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

38. Connect the Direct Probes to TB4-34 (high) and TB4-38 (low) on TPA #2 to monitor the Roll CDU DC D/A output.

39. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and set the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the Digital Voltmeter (DVM) to DC VOLTS.

S/C CONTROL OF SATURN TEST

40. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

41. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

42. Enter VERB 33 and press ENTR pushbutton on the DSKY.

43. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

44. Enter VERB 33 and press ENTR pushbutton on the DSKY.

45. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

46. Repeat steps 17 through 36 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash on the DSKY during performance of these steps. Exclude phase angle measurement in step 22.

47. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

41. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

42. Press EXECUTE pushbutton on Programmer and Monitor panel.

43. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

44. Press EXECUTE pushbutton on Programmer and Monitor panel.

45. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

46. Repeat steps 17 through 36 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash on the DSKY during performance of these steps. Exclude phase angle measurement in step 22.

47. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

48. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

YAW TVC MONITOR

49. Connect the Direct Probes to TB4-29 (high) and TB4-33 (low) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

50. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS, and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

NOTE: If AGC ALARMS indicator 2 lights on Logic Drawer No. 1 of CTS, press ALARM RESET pushbutton on Programmer and Monitor panel.

51. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

CTS UPLINK TAPE LOAD PROCEDURES

48. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

YAW TVC MONITOR

49. Connect the Direct Probes to TB4-29 (high) and TB4-33 (low) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

50. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS, and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

NOTE: If AGC ALARMS indicator 2 lights on Logic Drawer No. 1 of CTS, press ALARM RESET pushbutton on Programmer and Monitor panel.

51. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

MANUAL LOAD PROCEDURES

52. Enter VERB 33 and press ENTR pushbutton on the DSKY.

53. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X7373
c. Row 3 displays 00030

54. Enter VERB 33 and press ENTR pushbutton on the DSKY.

55. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays 37777
c. Row 3 displays 00031

56. Enter VERB 33 and press ENTR pushbutton on the DSKY.

57. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00003

Record the DVM voltage indication and sign.

NOTE: Row 3 of the DSKY shall display +00003 until completion of step 79.

58. Enter VERB 33 and press ENTR pushbutton on the DSKY.

59. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00384

CTS UPLINK TAPE LOAD PROCEDURES

52. Press EXECUTE pushbutton on Programmer and Monitor panel.

53. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X7373
c. Row 3 displays 00030

54. Press EXECUTE pushbutton on Programmer and Monitor panel.

55. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays 37777
c. Row 3 displays 00031

56. Press EXECUTE pushbutton on Programmer and Monitor panel.

57. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00003

Record the DVM voltage indication and sign.

NOTE: Row 3 of the DSKY shall display +00003 until completion of step 79.

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00384

MANUAL LOAD PROCEDURES

c. Row 2 displays -00384
d. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

60. Press VERB 33 and press ENTR pushbutton on the DSKY.

61. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160

Record the DVM voltage indication and sign.

62. Enter VERB 33 and press ENTR pushbutton on the DSKY.

63. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135

Record the DVM voltage indication and sign.

64. Enter VERB 33 and press ENTR pushbutton on the DSKY.

65. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090

Record the DVM voltage indication and sign.

66. Set OPTICS SPEED switch on Indicator Control panel to HI.

67. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

c. Row 2 displays -00384
d. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

61. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160

Record the DVM voltage indication and sign.

62. Press EXECUTE pushbutton on Programmer and Monitor panel.

63. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135

Record the DVM voltage indication and sign.

64. Press EXECUTE pushbutton on Programmer and Monitor panel.

65. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090

Record the DVM voltage indication and sign.

66. Set OPTICS SPEED switch on Indicator Control panel to HI.

67. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

68. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000

While holding the Optics Hand Controller on the Indicator Control panel up and left (45°) no longer than 10 seconds, record the DVM voltage indication and sign.

69. Enter VERB 33 and press ENTR pushbutton on the DSKY.

70. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090

Record the DVM voltage indication and sign.

> CAUTION: The TRUNNION TPAC on the OUA must indicate between 0 and 10 degrees before the OUA is commanded to zero. Manipulate the Optics Hand Controller on the Indicator Control panel vertically to drive the trunnion axis in a decreasing direction until the TRUNNION TPAC indicates between 0 and 10 degrees. The OPTICS SPEED switch may be adjusted to facilitate positioning the trunnion axis. Do not drive the trunnion axis through zero to the negative limit stop.

CTS UPLINK TAPE LOAD PROCEDURES

68. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000

While holding the Optics Hand Controller on the Indicator Control panel up and left (45°) no longer than 10 seconds, record the DVM voltage indication and sign.

69. Press EXECUTE pushbutton on Programmer and Monitor panel.

70. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090

Record the DVM voltage indication and sign.

> CAUTION: The TRUNNION TPAC on the OUA must indicate between 0 and 10 degrees before the OUA is commanded to zero. Manipulate the Optics Hand Controller on the Indicator Control panel vertically to drive the trunnion axis in a decreasing direction until the TRUNNION TPAC indicates between 0 and 10 degrees. The OPTICS SPEED switch may be adjusted to facilitate positioning the trunnion axis. Do not drive the trunnion axis through zero to the negative limit stop.

MANUAL LOAD PROCEDURES

71. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

72. Enter VERB 33 and press ENTR pushbutton on the DSKY.

73. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135

Record the DVM voltage indication and sign.

74. Enter VERB 33 and press ENTR pushbutton on the DSKY.

75. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160

Record the DVM voltage indication and sign.

76. Enter VERB 33 and press ENTR pushbutton on the DSKY.

77. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384

Record the DVM voltage indication and sign.

CTS UPLINK TAPE LOAD PROCEDURES

71. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

72. Press EXECUTE pushbutton on Programmer and Monitor panel.

73. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135

Record the DVM voltage indication and sign.

74. Press EXECUTE pushbutton on Programmer and Monitor panel.

75. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160

Record the DVM voltage indication and sign.

76. Press EXECUTE pushbutton on Programmer and Monitor panel.

77. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384

Record the DVM voltage indication and sign.

MANUAL LOAD PROCEDURES

78. Enter VERB 33 and press ENTR pushbutton on the DSKY.

79. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385

Record the DVM voltage indication and sign.

TEST ABORT AND RESTART

80. Enter VERB 34 and press ENTR pushbutton on the DSKY.

81. Observe that the DSKY PROG display indicates 00.

82. Enter VERB 57 and press ENTR pushbutton on the DSKY.

83. Observe that VERB 21 NOUN 01 is flashing on the DSKY.

84. Enter 00013 and press ENTR pushbutton on the DSKY.

85. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. NO ATT lamp lights
c. PROG displays 07
d. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

86. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall go out.

CTS UPLINK TAPE LOAD PROCEDURES

78. Press EXECUTE pushbutton on Programmer and Monitor panel.

79. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385

Record the DVM voltage indication and sign.

TEST ABORT AND RESTART

80. Press EXECUTE pushbutton on Programmer and Monitor panel.

81. Observe that the DSKY PROG display indicates 00.

82. Press EXECUTE pushbutton on Programmer and Monitor panel.

83. Observe that VERB 21 NOUN 01 is flashing on the DSKY.

84. Press EXECUTE pushbutton on Programmer and Monitor panel.

85. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. NO ATT lamp lights
c. PROG displays 07
d. Row 1, Row 2, and R3 indicate approximately 0° Gimbal angles.

86. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall go out.

MANUAL LOAD PROCEDURES

PITCH (IG) CDU AC D/A MONITOR

87. Connect the Buffered Probes to TB4-45 (high) and TB4-49 (low) on TPA #2 to monitor the Pitch CDU AC Att Error.

88. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

ATTITUDE ERROR (FDAI) TEST

89. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.

PITCH (IG) CDU DC D/A MONITOR

90. Connect the Direct Probes to TB4-36 (high) and TB4-40 (low) on TPA #2 to monitor the Pitch CDU DC D/A output.

91. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on DVM to DC VOLTS.

S/C CONTROL OF SATURN TEST

92. Enter VERB 33 and press ENTR pushbutton on the DSKY.

93. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

94. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

PITCH (IG) CDU AC D/A MONITOR

87. Connect the Buffered Probes to TB4-45 (high) and TB4-49 (low) on TPA #2 to monitor the Pitch CDU AC Att Error.

88. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

ATTITUDE ERROR (FDAI) TEST

89. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.

PITCH (IG) CDU DC D/A MONITOR

90. Connect the Direct Probes to TB4-36 (high) and TB4-40 (low) on TPA #2 to monitor the Pitch CDU DC D/A output.

91. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on DVM to DC VOLTS.

S/C CONTROL OF SATURN TEST

92. Press EXECUTE pushbutton on Programmer and Monitor panel.

93. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

94. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

95. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

96. Enter VERB 33 and press ENTR pushbutton on the DSKY.

97. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp goes out
c. Row 1 displays +00385
d. Row 2 displays -00385
e. Row 3 displays +00385

Record the DVM voltage indication and sign.

98. Repeat steps 17 through 36 measuring the voltages on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.

99. Enter VERB 33 and press ENTR pushbutton on the DSKY.

100. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

PITCH TVC MONITOR

101. Connect the Direct Probes to TB4-28 (high) and TB4-32 (low) on TPA #2 to monitor the Pitch TVC output.

CTS UPLINK TAPE LOAD PROCEDURES

95. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

96. Press EXECUTE pushbutton on Programmer and Monitor panel.

97. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp goes out
c. Row 1 displays +00385
d. Row 2 displays -00385
e. Row 3 displays +00385

Record the DVM voltage indication and sign.

98. Repeat steps 17 through 36 measuring the voltages on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.

99. Press EXECUTE pushbutton on Programmer and Monitor panel.

100. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

PITCH TVC MONITOR

101. Connect the Direct Probes to TB4-28 (high) and TB4-32 (low) on TPA #2 to monitor the Pitch TVC output.

MANUAL LOAD PROCEDURES

TVC TEST

102. Repeat steps 50 through 86.

YAW (MG) CDU AC D/A MONITOR

103. Connect the Buffered Probes to TB4-44 (high) and TB4-48 (low) on TPA #2 to monitor the Yaw CDU AC Att Error.

104. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

ATTITUDE ERROR (FDAI) TEST

105. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.

YAW (MG) CDU DC D/A MONITOR

106. Connect the Direct Probes to TB4-35 (high) and TB4-39 (low) on TPA #2 to monitor the Yaw CDU DC D/A output.

107. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the DVM to DC VOLTS.

S/C CONTROL OF SATURN TEST

108. Enter VERB 33 and press ENTR pushbutton on the DSKY.

109. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

CTS UPLINK TAPE LOAD PROCEDURES

TVC TEST

102. Repeat steps 50 through 86.

YAW (MG) CDU AC D/A MONITOR

103. Connect the Buffered Probes to TB4-44 (high) and TB4-48 (low) on TPA #2 to monitor the Yaw CDU AC Att Error.

104. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

ATTITUDE ERROR (FDAI) TEST

105. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.

YAW (MG) CDU DC D/A MONITOR

106. Connect the Direct Probes to TB4-35 (high) and TB4-39 (low) on TPA #2 to monitor the Yaw CDU DC D/A output.

107. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the DVM to DC VOLTS.

S/C CONTROL OF SATURN TEST

108. Press EXECUTE pushbutton on Programmer and Monitor panel.

109. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

MANUAL LOAD PROCEDURES

110. Enter VERB 33 and press ENTR pushbutton on the DSKY.

111. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

112. Enter VERB 33 and press ENTR pushbutton on the DSKY.

113. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp goes out
c. Row 1 displays +00385
d. Row 2 displays -00385
e. Row 3 displays +00385

Record the DVM voltage indication and sign.

114. Repeat steps 17 through 36 measuring the voltage on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.

TEST ABORT

115. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall go out.

116. Enter VERB 34 and press ENTR pushbutton on the DSKY.

117. Observe that NO ATT lamp on DSKY is not lighted.

CTS UPLINK TAPE LOAD PROCEDURES

110. Press EXECUTE pushbutton on Programmer and Monitor panel.

111. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

112. Press EXECUTE pushbutton on Programmer and Monitor panel.

113. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp goes out
c. Row 1 displays +00385
d. Row 2 displays -00385
e. Row 3 displays +00385

Record the DVM voltage indication and sign.

114. Repeat steps 17 through 36 measuring the voltage on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.

TEST ABORT

115. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall go out.

116. Press EXECUTE pushbutton on Programmer and Monitor panel.

117. Observe that NO ATT lamp on DSKY is not lighted.

JOB SPACECRAFT DISPLAY AND CONTROL TEST | JDC 12221 REV J PAGE 21 OF 2

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

NOTE: If AGC ALARMS indicator 2 lights on Logic Drawer No. 1 of CTS, press ALARM RESET pushbutton on Programmer and Monitor panel.

118. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

119. Enter VERB 36 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: If AGC ALARMS indicator 2 lights on Logic Drawer No. 1 of CTS, press ALARM RESET pushbutton on Programmer and Monitor panel.

118. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

119. Press EXECUTE pushbutton on Programmer and Monitor panel.

120. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

121. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

122. Set AGREEMENT B switch on Logic Drawer No. 2 to OFF and then set AGREEMENT B digitswitches to XXXXXXXX.

123. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

124. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12221
REV. J
INITIAL TDRR 29882

JOB SPACECRAFT CONTROL AND DISPLAY TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE

NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16	Roll Att Error +00385	vac	+4.40		+5.72		
18	Roll Att Error +00384	vac	+4.40		+5.72		
20	Roll Att Error +00160	vac	+1.84		+2.38		
22	Roll Att Error +00135	vac	+1.55		+2.01		
	Roll Att Error Phase Angle	deg	-8.0		+8.0		
24	Roll Att Error +00090	vac	+1.04		+1.34		
26	Roll Att Error +00000	vac	-0.056		+0.056		
28	Roll Att Error -00090	vac	-1.04		-1.34		
30	Roll Att Error -00135	vac	-1.55		-2.01		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12221
REV J

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
32	Roll Att Error -00160	vac	-1.84		-2.38		
34	Roll Att Error -00384	vac	-4.40		-5.72		
36	Roll Att Error -00385	vac	-4.40		-5.72		
45	Roll S/C - Saturn +00385	vdc	+4.98		+5.60		
46 (18)	Roll S/C - Saturn +00384	vdc	+4.98		+5.60		
46 (20)	Roll S/C - Saturn +00160	vdc	+2.07		+2.34		
46 (22)	Roll S/C - Saturn +00135	vdc	+1.75		+1.98		
46 (24)	Roll S/C - Saturn +00090	vdc	+1.17		+1.32		
46 (26)	Roll S/C - Saturn +00000	vdc	-0.01		+0.01		
46 (28)	Roll S/C - Saturn -00090	vdc	-1.17		-1.32		
46 (30)	Roll S/C - Saturn -00135	vdc	-1.75		-1.98		
46 (32)	Roll S/C - Saturn -00160	vdc	-2.07		-2.34		
46 (34)	Roll S/C - Saturn -00384	vdc	-4.98		-5.60		
46 (36)	Roll S/C - Saturn -00385	vdc	-4.98		-5.60		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12221
REV. J

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
57	Yaw TVC +00385	vdc	+4.76		+5.36		
59	Yaw TVC +00384	vdc	+4.76		+5.36		
61	Yaw TVC +00160	vdc	+1.98		+2.24		
63	Yaw TVC +00135	vdc	+1.67		+1.89		
65	Yaw TVC +00090	vdc	+1.12		+1.26		
68	Yaw TVC +00000	vdc	-0.01		+0.01		
70	Yaw TVC -00090	vdc	-1.12		-1.26		
73	Yaw TVC -00135	vdc	-1.67		-1.89		
75	Yaw TVC -00160	vdc	-1.98		-2.24		
77	Yaw TVC -00384	vdc	-4.76		-5.36		
79	Yaw TVC -00385	vdc	-4.76		-5.36		
89 (16)	Pitch Att Error -00385	vac	-4.40		-5.72		
89 (18)	Pitch Att Error -00384	vac	-4.40		-5.72		
89 (20)	Pitch Att Error -00160	vac	-1.84		-2.38		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12221
REV. J

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
89 (22)	Pitch Att Error -00135	vac	-1.55		-2.01		
	Pitch Att Error Phase Angle	deg	+172.0		+188.0		
89 (24)	Pitch Att Error -00090	vac	-1.04		-1.34		
89 (26)	Pitch Att Error +00000	vac	-0.056		+0.056		
89 (28)	Pitch Att Error +00090	vac	+1.04		+1.34		
89 (30)	Pitch Att Error +00135	vac	+1.55		+2.01		
89 (32)	Pitch Att Error +00160	vac	+1.84		+2.38		
89 (34)	Pitch Att Error +00384	vac	+4.40		+5.72		
89 (36)	Pitch Att Error +00385	vac	+4.40		+5.72		
97	Pitch S/C - Saturn -00385	vdc	-4.98		-5.60		
98 (18)	Pitch S/C - Saturn -00384	vdc	-4.98		-5.60		
98 (20)	Pitch S/C - Saturn -00160	vdc	-2.07		-2.34		
98 (22)	Pitch S/C - Saturn -00135	vdc	-1.75		-1.98		
98 (24)	Pitch S/C - Saturn -00090	vdc	-1.17		-1.32		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC
NO. 12221
REV. J

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
98 (26)	Pitch S/C - Saturn -00000	vdc	-0.01		+0.01		
98 (28)	Pitch S/C - Saturn +00090	vdc	+1.17		+1.32		
98 (30)	Pitch S/C - Saturn +00135	vdc	+1.75		+1.98		
98 (32)	Pitch S/C - Saturn +00160	vdc	+2.07		+2.34		
98 (34)	Pitch S/C - Saturn +00384	vdc	+4.98		+5.60		
98 (36)	Pitch S/C - Saturn +00385	vdc	+4.98		+5.60		
102 (57)	Pitch TVC -00385	vdc	-4.76		-5.36		
102 (59)	Pitch TVC -00384	vdc	-4.76		-5.36		
102 (61)	Pitch TVC -00160	vdc	-1.98		-2.24		
102 (63)	Pitch TVC -00135	vdc	-1.67		-1.89		
102 (65)	Pitch TVC -00090	vdc	-1.12		-1.26		
(102 (68)	Pitch TVC +00000	vdc	-0.01		+0.01		
102 (70)	Pitch TVC +00090	vdc	+1.12		+1.26		
102 (73)	Pitch TVC +00135	vdc	+1.67		+1.89		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC
NO. 12221
REV. J

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
102 (75)	Pitch TVC +00160	vdc	+1.98		+2.24		
102 (77)	Pitch TVC +00384	vdc	+4.76		+5.36		
102 (79)	Pitch TVC +00385	vdc	+4.76		+5.36		
105 (16)	Yaw Att Error +00385	vac	+4.40		+5.72		
105 (18)	Yaw Att Error +00384	vac	+4.40		+5.72		
105 (20)	Yaw Att Error +00160	vac	+1.84		+2.38		
105 (22)	Yaw Att Error +00135	vac	+1.55		+2.01		
	Yaw Att Error Phase Angle	deg	-8.0		+8.0		
105 (24)	Yaw Att Error +00090	vac	+1.04		+1.34		
105 (26)	Yaw Att Error -00090	vac	-1.04		-1.34		
105 (28)	Yaw Att Error -00135	vac	-1.55		-2.01		
105 (30)	Yaw Att Error -00160	vac	-1.84		-2.38		
105 (32)	Yaw Att Error -00384	vac	-4.40		-5.72		
105 (34)	Yaw Att Error -00385	vac	-4.40		-5.72		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC
NO. 12221
REV. J

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
105 (36)	Yaw Att Error +00000	vac	-0.056		+0.056		
113	Yaw S/C - Saturn +00385	vdc	+4.98		+5.60		
114 (18)	Yaw S/C - Saturn +00384	vdc	+4.98		+5.60		
114 (20)	Yaw S/C - Saturn +00160	vdc	+2.07		+2.34		
114 (22)	Yaw S/C - Saturn +00135	vdc	+1.75		+1.98		
114 (24)	Yaw S/C - Saturn +00090	vdc	+1.17		+1.32		
114 (26)	Yaw S/C - Saturn -00090	vdc	-1.17		-1.32		
114 (28)	Yaw S/C - Saturn -00135	vdc	-1.75		-1.98		
114 (30)	Yaw S/C - Saturn -00160	vdc	-2.07		-2.34		
114 (32)	Yaw S/C - Saturn -00384	vdc	-4.98		-5.60		
114 (34)	Yaw S/C - Saturn -00385	vdc	-4.98		-5.60		
114 (36)	Yaw S/C - Saturn +00000	vdc	-0.01		+0.01		

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SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION During this test the CGC issues bit commands to the IMU/CDU DAC's resulting in specified ac total and phase outputs and dc voltage outputs of the Pitch, Roll, and Yaw Attitude Error signals. The CGC also issues bit commands to the Optics CDU DAC's resulting in specified dc voltage outputs of the Pitch and Yaw SPS Engine Steering signals.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30310	All	2,4	EA	WS
B	11-3-66	31780	All	-	EA	
C	11-10-66	31899	4,5	-	EA	-
D	11-15-66	31945	1,6,7	7	EA	-
E	9-6-67	34560	1	-	EA	-
F	10-12-67	34830	1,4,5,8	-	EA	-
G	2-2-68	35557	1,4,8	-	EA	-
H	5-29-68	36277	All	All	EA	-
J	12-3-68	37084	3,21	-	EA	-
K	3-11-69	37409	1,2,3,11,21	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC.

IMPORTANT: 1. Insure that cable W226 is removed and connector assembly (2003099) is connected to the CGC test connector before proceeding with this JDC.

2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

NOTE: DSKY displays specified in this JDC may in some cases be delayed approximately 15 seconds.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedure contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:

None

1. Perform JDC 12215 to establish a Master Initialization condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes on TPA #2 to TB4-43 (high) and TB4-47 (low) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT switch on the Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

4. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 800~#2.

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:

JDC 12221 CTS UPLINK Tape, P/N 2901627-001

1. Perform JDC 12215 to establish a Master Initialization condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes on TPA #2 to TB4-43 (high) and TB4-47 (low) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT switch on the Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

4. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 800~#2.

4A. Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) Connect Self Test Assembly, 2014392, to Buffer Box Assembly by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

(B) XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

(C) Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(D) RDC Interface panel - Press to light CH33-10 pushbutton.

(E) Tape Reader - Set Power switch to ON. If alarms occur, press RSET pushbutton on DSKY.

MANUAL LOAD PROCEDURES

5. Perform following DSKY operations:

a.	VERB 21	NOUN 01	ENTR	
b.	01300		ENTR	
c.	30067		ENTR	
d.		NOUN 15	ENTR	
e.	43662		ENTR	ENTR
f.	61426		ENTR	ENTR
g.	10000		ENTR	ENTR
h.	01300		ENTR	ENTR
i.	00033		ENTR	ENTR
j.	01300		ENTR	ENTR
k.	43663		ENTR	ENTR
l.	61426		ENTR	ENTR
m.	10000		ENTR	ENTR
n.	01307		ENTR	ENTR
o.	37633		ENTR	ENTR
p.	01307		ENTR	ENTR
q.	31313		ENTR	ENTR
r.	54026		ENTR	ENTR
s.	54027		ENTR	ENTR

CTS UPLINK TAPE LOAD PROCEDURES

(F) Load the CTS UPLINK tape in the Tape Reader.

(G) Self Test panel - Press to light SELF TEST pushbutton. Insure that digiswitches on Self Test panel and on Self Test Assembly are set to 00000.

(H) Programmer and Monitor panel - Press EXECUTE pushbutton.

(I) Verify that the tape advances to the beginning of the first UPLINK code.

(J) Programmer and Monitor panel - Press EXECUTE pushbutton.

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: The UPLINK ACTY lamp on the DSKY will light during performance of this test.

MANUAL LOAD PROCEDURES

t.	04317		ENTR	ENTR
u.	10067		ENTR	ENTR
v.	01324		ENTR	ENTR
w.	01321		ENTR	ENTR
x.	41305		ENTR	ENTR
y.	60266		ENTR	ENTR
z.	10000		ENTR	ENTR
aa.	01320		ENTR	ENTR
ab.	00000		ENTR	ENTR
ac.	01320		ENTR	ENTR
ad.	01300		ENTR	
ae.	VERB 01	NOUN 01	ENTR	
af.	01300		ENTR	

6. Observe that Row 1 on the DSKY indicates 30067.

7. Enter NOUN 15 and press the ENTR pushbutton on the DSKY.

8. Observe that Row 1 on the DSKY indicates 43662.

9. Press the ENTR pushbutton on the DSKY for each test listed below. For each test, observe that the DSKY Row 1 indicates as specified:

Test	DSKY Row 1 Indication
a.	61426
b.	10000
c.	01300
d.	00033
e.	01300
f.	43663

CTS UPLINK TAPE LOAD PROCEDURES

6. Observe that Row 1 on the DSKY indicates 30067.

7. Press EXECUTE pushbutton on Programmer and Monitor panel.

8. Observe that Row 1 on the DSKY indicates 43662.

9. Press the EXECUTE pushbutton on the Programmer and Monitor panel for each test listed below. For each test, observe that the DSKY Row 1 indicates as specified:

Test	DSKY Row 1 Indication
a.	61426
b.	10000
c.	01300
d.	00033
e.	01300
f.	43663

MANUAL LOAD PROCEDURES

Test	DSKY Row 1 Indication
g.	61426
h.	10000
i.	01307
j.	37633
k.	01307
l.	31313
m.	54026
n.	54027
o.	04317
p.	10067
q.	01324
r.	01321
s.	41305
t.	60266
u.	10000
v.	01320
w.	00000
x.	01320
y.	01300

10. Perform following DSKY operations:

a. VERB 25 NOUN 26 ENTR

b. 02000 ENTR

c. 01321 ENTR

d. 12007 ENTR

11. Observe that Row 1, Row 2, and Row 3 on the DSKY indicate as follows:

a. Row 1 displays 02000

b. Row 2 displays 01321

c. Row 3 displays 12007

CTS UPLINK TAPE LOAD PROCEDURES

Test	DSKY Row 1 Indication
g.	61426
h.	10000
i.	01307
j.	37633
k.	01307
l.	31313
m.	54026
n.	54027
o.	04317
p.	10067
q.	01324
r.	01321
s.	41305
t.	60266
u.	10000
v.	01320
w.	00000
x.	01320
y.	01300

10. Press EXECUTE pushbutton on Programmer and Monitor panel.

11. Observe that Row 1, Row 2, and Row 3 on the DSKY indicate as follows:

a. Row 1 displays 02000

b. Row 2 displays 01321

c. Row 3 displays 12007

MANUAL LOAD PROCEDURES

12. Enter VERB 30 and press ENTR pushbutton on the DSKY.

13. Perform following DSKY operations:

a. VERB 57 ENTR

b. 00013 ENTR

14. Observe that the DSKY displays the following:

a. PROG displays 07

b. VERB 06 NOUN 01 Flashing

c. NO ATT lamp lights

d. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

15. Enter VERB 33 and press ENTR pushbutton on the DSKY.

16. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays +00385

c. Row 2 displays -00385

d. Row 3 displays +00385

e. NO ATT lamp goes out.

Record the PAVM voltage indication and sign.

17. Enter VERB 33 and press ENTR pushbutton on the DSKY.

18. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays +00384

c. Row 2 displays -00384

d. Row 3 displays +00384

Record the PAVM voltage indication and sign.

CTS UPLINK TAPE LOAD PROCEDURES

12. Press EXECUTE pushbutton on Programmer and Monitor panel.

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

14. Observe that the DSKY displays the following:

a. PROG displays 07

b. VERB 06 NOUN 01 Flashing

c. NO ATT lamp lights

d. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

15. Press EXECUTE pushbutton on Programmer and Monitor panel.

16. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays +00385

c. Row 2 displays -00385

d. Row 3 displays +00385

e. NO ATT lamp goes out.

Record the PAVM voltage indication and sign.

17. Press EXECUTE pushbutton on Programmer and Monitor panel.

18. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays +00384

c. Row 2 displays -00384

d. Row 3 displays +00384

Record the PAVM voltage indication and sign.

MANUAL LOAD PROCEDURES

19. Enter VERB 33 and press ENTR pushbutton on the DSKY.

20. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays +00160

c. Row 2 displays -00160

d. Row 3 displays +00160

Record the PAVM voltage indication and sign.

21. Enter VERB 33 and press ENTR pushbutton on the DSKY.

22. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays +00135

c. Row 2 displays -00135

d. Row 3 displays +00135

Record the PAVM voltage indication and sign.

Determine and record the phase angle of the signal.

23. Enter VERB 33 and press ENTR pushbutton on the DSKY.

24. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays +00090

c. Row 2 displays -00090

d. Row 3 displays +00090

Record the PAVM voltage indication and sign.

25. Enter VERB 33 and press ENTR pushbutton on the DSKY.

26. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

CTS UPLINK TAPE LOAD PROCEDURES

19. Press EXECUTE pushbutton on Programmer and Monitor panel.

20. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays +00160

c. Row 2 displays -00160

d. Row 3 displays +00160

Record the PAVM voltage indication and sign.

21. Press EXECUTE pushbutton on Programmer and Monitor panel.

22. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays +00135

c. Row 2 displays -00135

d. Row 3 displays +00135

Record the PAVM voltage indication and sign.

Determine and record the phase angle of the signal.

23. Press EXECUTE pushbutton on Programmer and Monitor panel.

24. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays +00090

c. Row 2 displays -00090

d. Row 3 displays +00090

Record the PAVM voltage indication and sign.

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

26. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

MANUAL LOAD PROCEDURES

b. Row 1 displays +00000

c. Row 2 displays +00000

d. Row 3 displays -00090

Record the PAVM voltage indication and sign.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays -00090

c. Row 2 displays +00090

d. Row 3 displays -00135

Record the PAVM voltage indication and sign.

29. Enter VERB 33 and press ENTR pushbutton on the DSKY.

30. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays -00135

c. Row 2 displays +00135

d. Row 3 displays -00160

Record the PAVM voltage indication and sign.

31. Enter VERB 33 and press ENTR pushbutton on the DSKY.

32. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays -00160

c. Row 2 displays +00160

d. Row 3 displays -00384

Record the PAVM voltage indication and sign.

CTS UPLINK TAPE LOAD PROCEDURES

b. Row 1 displays +00000

c. Row 2 displays +00000

d. Row 3 displays -00090

Record the PAVM voltage indication and sign.

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

28. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays -00090

c. Row 2 displays +00090

d. Row 3 displays -00135

Record the PAVM voltage indication and sign.

29. Press EXECUTE pushbutton on Programmer and Monitor panel.

30. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays -00135

c. Row 2 displays +00135

d. Row 3 displays -00160

Record the PAVM voltage indication and sign.

31. Press EXECUTE pushbutton on Programmer and Monitor panel.

32. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. Row 1 displays -00160

c. Row 2 displays +00160

d. Row 3 displays -00384

Record the PAVM voltage indication and sign.

MANUAL LOAD PROCEDURES

33. Enter VERB 33 and press ENTR pushbutton on the DSKY.

34. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384
d. Row 3 displays -00385

Record the PAVM voltage indication and sign.

35. Enter VERB 33 and press ENTR pushbutton on the DSKY.

36. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385
d. Row 3 displays +00000

Record the PAVM voltage indication and sign.

37. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

38. Connect the Direct Probes to TB4-34 (high) and TB4-38 (low) on TPA #2 to monitor the Roll CDU DC D/A output.

39. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and set the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the Digital Voltmeter (DVM) to DC VOLTS.

S/C CONTROL OF SATURN TEST

40. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

34. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384
d. Row 3 displays -00385

Record the PAVM voltage indication and sign.

35. Press EXECUTE pushbutton on Programmer and Monitor panel.

36. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385
d. Row 3 displays +00000

Record the PAVM voltage indication and sign.

37. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

38. Connect the Direct Probes to TB4-34 (high) and TB4-38 (low) on TPA #2 to monitor the Roll CDU DC D/A output.

39. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and set the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the Digital Voltmeter (DVM) to DC VOLTS.

S/C CONTROL OF SATURN TEST

40. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

41. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

42. Enter VERB 33 and press ENTR pushbutton on the DSKY.

43. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

44. Enter VERB 33 and press ENTR pushbutton on the DSKY.

45. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

46. Repeat steps 17 through 36 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash on the DSKY during performance of these steps. Exclude phase angle measurement in step 22.

47. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

41. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

42. Press EXECUTE pushbutton on Programmer and Monitor panel.

43. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

44. Press EXECUTE pushbutton on Programmer and Monitor panel.

45. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

46. Repeat steps 17 through 36 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash on the DSKY during performance of these steps. Exclude phase angle measurement in step 22.

47. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

48. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

YAW TVC MONITOR

49. Connect the Direct Probes to TB4-29 (high) and TB4-33 (low) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

50. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS, and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

NOTE: Deleted

51. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

CTS UPLINK TAPE LOAD PROCEDURES

48. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

YAW TVC MONITOR

49. Connect the Direct Probes to TB4-29 (high) and TB4-33 (low) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

50. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS, and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

NOTE: Deleted

51. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

MANUAL LOAD PROCEDURES

52. Enter VERB 33 and press ENTR pushbutton on the DSKY.

53. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X7373
c. Row 3 displays 00030

54. Enter VERB 33 and press ENTR pushbutton on the DSKY.

55. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays 37777
c. Row 3 displays 00031

56. Enter VERB 33 and press ENTR pushbutton on the DSKY.

57. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00003

Record the DVM voltage indication and sign.

NOTE: Row 3 of the DSKY shall display +00003 until completion of step 79.

58. Enter VERB 33 and press ENTR pushbutton on the DSKY.

59. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00384

CTS UPLINK TAPE LOAD PROCEDURES

52. Press EXECUTE pushbutton on Programmer and Monitor panel.

53. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X7373
c. Row 3 displays 00030

54. Press EXECUTE pushbutton on Programmer and Monitor panel.

55. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays 37777
c. Row 3 displays 00031

56. Press EXECUTE pushbutton on Programmer and Monitor panel.

57. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00003

Record the DVM voltage indication and sign.

NOTE: Row 3 of the DSKY shall display +00003 until completion of step 79.

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00384

MANUAL LOAD PROCEDURES

c. Row 2 displays -00384

d. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

60. Press VERB 33 and press ENTR pushbutton on the DSKY.

61. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays +00160

c. Row 2 displays -00160

Record the DVM voltage indication and sign.

62. Enter VERB 33 and press ENTR pushbutton on the DSKY.

63. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays +00135

c. Row 2 displays -00135

Record the DVM voltage indication and sign.

64. Enter VERB 33 and press ENTR pushbutton on the DSKY.

65. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays +00090

c. Row 2 displays -00090

Record the DVM voltage indication and sign.

66. Set OPTICS SPEED switch on Indicator Control panel to HI.

67. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

c. Row 2 displays -00384

d. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

61. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays +00160

c. Row 2 displays -00160

Record the DVM voltage indication and sign.

62. Press EXECUTE pushbutton on Programmer and Monitor panel.

63. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays +00135

c. Row 2 displays -00135

Record the DVM voltage indication and sign.

64. Press EXECUTE pushbutton on Programmer and Monitor panel.

65. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays +00090

c. Row 2 displays -00090

Record the DVM voltage indication and sign.

66. Set OPTICS SPEED switch on Indicator Control panel to HI.

67. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

68. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays +00000

c. Row 2 displays +00000

While holding the Optics Hand Controller on the Indicator Control panel up and left (45°) no longer than 10 seconds, record the DVM voltage indication and sign.

69. Enter VERB 33 and press ENTR pushbutton on the DSKY.

70. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays -00090

c. Row 2 displays +00090

Record the DVM voltage indication and sign.

CAUTION: The TRUNNION TPAC on the OUA must indicate between 0 and 10 degrees before the OUA is commanded to zero. Manipulate the Optics Hand Controller on the Indicator Control panel vertically to drive the trunnion axis in a decreasing direction until the TRUNNION TPAC indicates between 0 and 10 degrees. The OPTICS SPEED switch may be adjusted to facilitate positioning the trunnion axis. Do not drive the trunnion axis through zero to the negative limit stop.

CTS UPLINK TAPE LOAD PROCEDURES

68. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays +00000

c. Row 2 displays +00000

While holding the Optics Hand Controller on the Indicator Control panel up and left (45°) no longer than 10 seconds, record the DVM voltage indication and sign.

69. Press EXECUTE pushbutton on Programmer and Monitor panel.

70. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays -00090

c. Row 2 displays +00090

Record the DVM voltage indication and sign.

CAUTION: The TRUNNION TPAC on the OUA must indicate between 0 and 10 degrees before the OUA is commanded to zero. Manipulate the Optics Hand Controller on the Indicator Control panel vertically to drive the trunnion axis in a decreasing direction until the TRUNNION TPAC indicates between 0 and 10 degrees. The OPTICS SPEED switch may be adjusted to facilitate positioning the trunnion axis. Do not drive the trunnion axis through zero to the negative limit stop.

MANUAL LOAD PROCEDURES

71. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

72. Enter VERB 33 and press ENTR pushbutton on the DSKY.

73. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays -00135

c. Row 2 displays +00135

Record the DVM voltage indication and sign.

74. Enter VERB 33 and press ENTR pushbutton on the DSKY.

75. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays -00160

c. Row 2 displays +00160

Record the DVM voltage indication and sign.

76. Enter VERB 33 and press ENTR pushbutton on the DSKY.

77. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays -00384

c. Row 2 displays +00384

Record the DVM voltage indication and sign.

CTS UPLINK TAPE LOAD PROCEDURES

71. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

72. Press EXECUTE pushbutton on Programmer and Monitor panel.

73. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays -00135

c. Row 2 displays +00135

Record the DVM voltage indication and sign.

74. Press EXECUTE pushbutton on Programmer and Monitor panel.

75. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays -00160

c. Row 2 displays +00160

Record the DVM voltage indication and sign.

76. Press EXECUTE pushbutton on Programmer and Monitor panel.

77. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays -00384

c. Row 2 displays +00384

Record the DVM voltage indication and sign.

MANUAL LOAD PROCEDURES

78. Enter VERB 33 and press ENTR pushbutton on the DSKY.

79. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays -00385

c. Row 2 displays +00385

Record the DVM voltage indication and sign.

TEST ABORT AND RESTART

80. Enter VERB 34 and press ENTR pushbutton on the DSKY.

81. Observe that the DSKY PROG display indicates 00.

82. Enter VERB 57 and press ENTR pushbutton on the DSKY.

83. Observe that VERB 21 NOUN 01 is flashing on the DSKY.

84. Enter 00013 and press ENTR pushbutton on the DSKY.

85. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. NO ATT lamp lights

c. PROG displays 07

d. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

86. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall go out.

CTS UPLINK TAPE LOAD PROCEDURES

78. Press EXECUTE pushbutton on Programmer and Monitor panel.

79. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing

b. Row 1 displays -00385

c. Row 2 displays +00385

Record the DVM voltage indication and sign.

TEST ABORT AND RESTART

80. Press EXECUTE pushbutton on Programmer and Monitor panel.

81. Observe that the DSKY PROG display indicates 00.

82. Press EXECUTE pushbutton on Programmer and Monitor panel.

83. Observe that VERB 21 NOUN 01 is flashing on the DSKY.

84. Press EXECUTE pushbutton on Programmer and Monitor panel.

85. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

b. NO ATT lamp lights

c. PROG displays 07

d. Row 1, Row 2, and R3 indicate approximately 0° Gimbal angles.

86. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall go out.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
PITCH (IG) CDU AC D/A MONITOR	PITCH (IG) CDU AC D/A MONITOR
87. Connect the Buffered Probes to TB4-45 (high) and TB4-49 (low) on TPA #2 to monitor the Pitch CDU AC Att Error.	87. Connect the Buffered Probes to TB4-45 (high) and TB4-49 (low) on TPA #2 to monitor the Pitch CDU AC Att Error.
88. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.	88. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.
ATTITUDE ERROR (FDAI) TEST	ATTITUDE ERROR (FDAI) TEST
89. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.	89. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.
PITCH (IG) CDU DC D/A MONITOR	PITCH (IG) CDU DC D/A MONITOR
90. Connect the Direct Probes to TB4-36 (high) and TB4-40 (low) on TPA #2 to monitor the Pitch CDU DC D/A output.	90. Connect the Direct Probes to TB4-36 (high) and TB4-40 (low) on TPA #2 to monitor the Pitch CDU DC D/A output.
91. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on DVM to DC VOLTS.	91. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on DVM to DC VOLTS.
S/C CONTROL OF SATURN TEST	S/C CONTROL OF SATURN TEST
92. Enter VERB 33 and press ENTR pushbutton on the DSKY.	92. Press EXECUTE pushbutton on Programmer and Monitor panel.
93. Observe that the DSKY displays the following:	93. Observe that the DSKY displays the following:
a. VERB 06 NOUN 02 Flashing	a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights	b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.	c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.
94. Enter VERB 33 and press ENTR pushbutton on the DSKY.	94. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
95. Observe that the DSKY displays the following:	95. Observe that the DSKY displays the following:
a. VERB 01 NOUN 10 Flashing	a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377	b. Row 1 displays X6377
c. Row 3 displays 00030	c. Row 3 displays 00030
96. Enter VERB 33 and press ENTR pushbutton on the DSKY.	96. Press EXECUTE pushbutton on Programmer and Monitor panel.
97. Observe that the DSKY displays the following:	97. Observe that the DSKY displays the following:
a. VERB 06 NOUN 02 Flashing	a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp goes out	b. NO ATT lamp goes out
c. Row 1 displays +00385	c. Row 1 displays +00385
d. Row 2 displays -00385	d. Row 2 displays -00385
e. Row 3 displays +00385	e. Row 3 displays +00385
Record the DVM voltage indication and sign.	Record the DVM voltage indication and sign.
98. Repeat steps 17 through 36 measuring the voltages on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.	98. Repeat steps 17 through 36 measuring the voltages on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.
99. Enter VERB 33 and press ENTR pushbutton on the DSKY.	99. Press EXECUTE pushbutton on Programmer and Monitor panel.
100. Observe that the DSKY displays the following:	100. Observe that the DSKY displays the following:
a. VERB 06 NOUN 03 Flashing	a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights	b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.	c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.
PITCH TVC MONITOR	PITCH TVC MONITOR
101. Connect the Direct Probes to TB4-28 (high) and TB4-32 (low) on TPA #2 to monitor the Pitch TVC output.	101. Connect the Direct Probes to TB4-28 (high) and TB4-32 (low) on TPA #2 to monitor the Pitch TVC output.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
TVC TEST	TVC TEST
102. Repeat steps 50 through 86.	102. Repeat steps 50 through 86.
YAW (MG) CDU AC D/A MONITOR	YAW (MG) CDU AC D/A MONITOR
103. Connect the Buffered Probes to TB4-44 (high) and TB4-48 (low) on TPA #2 to monitor the Yaw CDU AC Att Error.	103. Connect the Buffered Probes to TB4-44 (high) and TB4-48 (low) on TPA #2 to monitor the Yaw CDU AC Att Error.
104. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.	104. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.
ATTITUDE ERROR (FDAI) TEST	ATTITUDE ERROR (FDAI) TEST
105. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.	105. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.
YAW (MG) CDU DC D/A MONITOR	YAW (MG) CDU DC D/A MONITOR
106. Connect the Direct Probes to TB4-35 (high) and TB4-39 (low) on TPA #2 to monitor the Yaw CDU DC D/A output.	106. Connect the Direct Probes to TB4-35 (high) and TB4-39 (low) on TPA #2 to monitor the Yaw CDU DC D/A output.
107. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the DVM to DC VOLTS.	107. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the DVM to DC VOLTS.
S/C CONTROL OF SATURN TEST	S/C CONTROL OF SATURN TEST
108. Enter VERB 33 and press ENTR pushbutton on the DSKY.	108. Press EXECUTE pushbutton on Programmer and Monitor panel.
109. Observe that the DSKY displays the following:	109. Observe that the DSKY displays the following:
a. VERB 06 NOUN 02 Flashing	a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights	b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.	c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
110. Enter VERB 33 and press ENTR pushbutton on the DSKY.	110. Press EXECUTE pushbutton on Programmer and Monitor panel.
111. Observe that the DSKY displays the following:	111. Observe that the DSKY displays the following:
a. VERB 01 NOUN 10 Flashing	a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377	b. Row 1 displays X6377
c. Row 3 displays 00030	c. Row 3 displays 00030
112. Enter VERB 33 and press ENTR pushbutton on the DSKY.	112. Press EXECUTE pushbutton on Programmer and Monitor panel.
113. Observe that the DSKY displays the following:	113. Observe that the DSKY displays the following:
a. VERB 06 NOUN 02 Flashing	a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp goes out	b. NO ATT lamp goes out
c. Row 1 displays +00385	c. Row 1 displays +00385
d. Row 2 displays -00385	d. Row 2 displays -00385
e. Row 3 displays +00385	e. Row 3 displays +00385
Record the DVM voltage indication and sign.	Record the DVM voltage indication and sign.
114. Repeat steps 17 through 36 measuring the voltage on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.	114. Repeat steps 17 through 36 measuring the voltage on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.
TEST ABORT	TEST ABORT
115. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall go out.	115. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall go out.
116. Enter VERB 34 and press ENTR pushbutton on the DSKY.	116. Press EXECUTE pushbutton on Programmer and Monitor panel.
117. Observe that NO ATT lamp on DSKY is not lighted.	117. Observe that NO ATT lamp on DSKY is not lighted.

JOB SPACECRAFT DISPLAY AND CONTROL TEST
JDC 12221 REV K PAGE 21 OF 21

SUBSYSTEM G & N SYSTEM
ASSY

MANUAL LOAD PROCEDURES

118. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

119. Enter VERB 36 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

118. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

119. Press EXECUTE pushbutton on Programmer and Monitor panel.

120. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

121. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

122. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

123. Rewind and remove tape from Tape Reader and set Power switch to OFF. If alarms occur, press RSET pushbutton on DSKY.

124. Disconnect Self Test Assembly from Buffer Box Assembly.

125. Press to extinguish SELF TEST pushbutton on Self Test panel.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12221
REV. K
INITIAL TDRR 29882

JOB SPACECRAFT CONTROL AND DISPLAY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION
APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16	Roll Att Error +00385	vac	+4.40		+5.72		
18	Roll Att Error +00384	vac	+4.40		+5.72		
20	Roll Att Error +00160	vac	+1.84		+2.38		
22	Roll Att Error +00135	vac	+1.55		+2.01		
	Roll Att Error Phase Angle	deg	-8.0		+8.0		
24	Roll Att Error +00090	vac	+1.04		+1.34		
26	Roll Att Error +00000	vac	-0.056		+0.056		
28	Roll Att Error -00090	vac	-1.04		-1.34		
30	Roll Att Error -00135	vac	-1.55		-2.01		

DATE 30 JUN 66

FORM 0014
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12221
REV. K

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
32	Roll Att Error -00160	vac	-1.84		-2.38		
34	Roll Att Error -00384	vac	-4.40		-5.72		
36	Roll Att Error -00385	vac	-4.40		-5.72		
45	Roll S/C - Saturn +00385	vdc	+4.98		+5.60		
46 (18)	Roll S/C - Saturn +00384	vdc	+4.98		+5.60		
46 (20)	Roll S/C - Saturn +00160	vdc	+2.07		+2.34		
46 (22)	Roll S/C - Saturn +00135	vdc	+1.75		+1.98		
46 (24)	Roll S/C - Saturn +00090	vdc	+1.17		+1.32		
46 (26)	Roll S/C - Saturn +00000	vdc	-0.01		+0.01		
46 (28)	Roll S/C - Saturn -00090	vdc	-1.17		-1.32		
46 (30)	Roll S/C - Saturn -00135	vdc	-1.75		-1.98		
46 (32)	Roll S/C - Saturn -00160	vdc	-2.07		-2.34		
46 (34)	Roll S/C - Saturn -00384	vdc	-4.98		-5.60		
46 (36)	Roll S/C - Saturn -00385	vdc	-4.98		-5.60		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12221
REV. K

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
57	Yaw TVC +00385	vdc	+4.76		+5.36		
59	Yaw TVC +00384	vdc	+4.76		+5.36		
61	Yaw TVC +00160	vdc	+1.98		+2.24		
63	Yaw TVC +00135	vdc	+1.67		+1.89		
65	Yaw TVC +00090	vdc	+1.12		+1.26		
68	Yaw TVC +00000	vdc	-0.01		+0.01		
70	Yaw TVC -00090	vdc	-1.12		-1.26		
73	Yaw TVC -00135	vdc	-1.67		-1.89		
75	Yaw TVC -00160	vdc	-1.98		-2.24		
77	Yaw TVC -00384	vdc	-4.76		-5.36		
79	Yaw TVC -00385	vdc	-4.76		-5.36		
89 (16)	Pitch Att Error -00385	vac	-4.40		-5.72		
89 (18)	Pitch Att Error -00384	vac	-4.40		-5.72		
89 (20)	Pitch Att Error -00160	vac	-1.84		-2.38		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12221
REV. K

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
89 (22)	Pitch Att Error -00135	vac	-1.55		-2.01		
	Pitch Att Error Phase Angle	deg	+172.0		+188.0		
89 (24)	Pitch Att Error -00090	vac	-1.04		-1.34		
89 (26)	Pitch Att Error +00000	vac	-0.056		+0.056		
89 (28)	Pitch Att Error +00090	vac	+1.04		+1.34		
89 (30)	Pitch Att Error +00135	vac	+1.55		+2.01		
89 (32)	Pitch Att Error +00160	vac	+1.84		+2.38		
89 (34)	Pitch Att Error +00384	vac	+4.40		+5.72		
89 (36)	Pitch Att Error +00385	vac	+4.40		+5.72		
97	Pitch S/C - Saturn -00385	vdc	-4.98		-5.60		
98 (18)	Pitch S/C - Saturn -00384	vdc	-4.98		-5.60		
98 (20)	Pitch S/C - Saturn -00160	vdc	-2.07		-2.34		
98 (22)	Pitch S/C - Saturn -00135	vdc	-1.75		-1.98		
98 (24)	Pitch S/C - Saturn -00090	vdc	-1.17		-1.32		

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EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC
NO. 12221
REV. K

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
98 (26)	Pitch S/C - Saturn -00000	vdc	-0.01		+0.01		
98 (28)	Pitch S/C - Saturn +00090	vdc	+1.17		+1.32		
98 (30)	Pitch S/C - Saturn +00135	vdc	+1.75		+1.98		
98 (32)	Pitch S/C - Saturn +00160	vdc	+2.07		+2.34		
98 (34)	Pitch S/C - Saturn +00384	vdc	+4.98		+5.60		
98 (36)	Pitch S/C - Saturn +00385	vdc	+4.98		+5.60		
102 (57)	Pitch TVC -00385	vdc	-4.76		-5.36		
102 (59)	Pitch TVC -00384	vdc	-4.76		-5.36		
102 (61)	Pitch TVC -00160	vdc	-1.98		-2.24		
102 (63)	Pitch TVC -00135	vdc	-1.67		-1.89		
102 (65)	Pitch TVC -00090	vdc	-1.12		-1.26		
(102 (68)	Pitch TVC +00000	vdc	-0.01		+0.01		
102 (70)	Pitch TVC +00090	vdc	+1.12		+1.26		
102 (73)	Pitch TVC +00135	vdc	+1.67		+1.89		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC
NO. 12221
REV. K

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
102 (75)	Pitch TVC +00160	vdc	+1.98		+2.24		
102 (77)	Pitch TVC +00384	vdc	+4.76		+5.36		
102 (79)	Pitch TVC +00385	vdc	+4.76		+5.36		
105 (16)	Yaw Att Error +00385	vac	+4.40		+5.72		
105 (18)	Yaw Att Error +00384	vac	+4.40		+5.72		
105 (20)	Yaw Att Error +00160	vac	+1.84		+2.38		
105 (22)	Yaw Att Error +00135	vac	+1.55		+2.01		
	Yaw Att Error Phase Angle	deg	-8.0		+8.0		
105 (24)	Yaw Att Error +00090	vac	+1.04		+1.34		
105 (26)	Yaw Att Error -00090	vac	-1.04		-1.34		
105 (28)	Yaw Att Error -00135	vac	-1.55		-2.01		
105 (30)	Yaw Att Error -00160	vac	-1.84		-2.38		
105 (32)	Yaw Att Error -00384	vac	-4.40		-5.72		
105 (34)	Yaw Att Error -00385	vac	-4.40		-5.72		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC
NO. 12221
REV. K

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
105 (36)	Yaw Att Error +00000	vac	-0.056		+0.056		
113	Yaw S/C - Saturn +00385	vdc	+4.98		+5.60		
114 (18)	Yaw S/C - Saturn +00384	vdc	+4.98		+5.60		
114 (20)	Yaw S/C - Saturn +00160	vdc	+2.07		+2.34		
114 (22)	Yaw S/C - Saturn +00135	vdc	+1.75		+1.98		
114 (24)	Yaw S/C - Saturn +00090	vdc	+1.17		+1.32		
114 (26)	Yaw S/C - Saturn -00090	vdc	-1.17		-1.32		
114 (28)	Yaw S/C - Saturn -00135	vdc	-1.75		-1.98		
114 (30)	Yaw S/C - Saturn -00160	vdc	-2.07		-2.34		
114 (32)	Yaw S/C - Saturn -00384	vdc	-4.98		-5.60		
114 (34)	Yaw S/C - Saturn -00385	vdc	-4.98		-5.60		
114 (36)	Yaw S/C - Saturn +00000	vdc	-0.01		+0.01		

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV. L PAGE 1 OF 21
INITIAL TDRR 29882 D.S. PGS 7

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION During this test the CGC issues bit commands to the IMU/CDU DAC's resulting in specified ac total and phase outputs and dc voltage outputs of the Pitch, Roll, and Yaw Attitude Error signals. The CGC also issues bit commands to the Optics CDU DAC's resulting in specified dc voltage outputs of the Pitch and Yaw SPS Engine Steering signals.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30310	All	2,4	EA	WS
B	11-3-66	31780	All	-	EA	
C	11-10-66	31899	4,5	-	EA	-
D	11-15-66	31945	1,6,7	7	EA	-
E	9-6-67	34560	1	-	EA	-
F	10-12-67	34830	1,4,5,8	-	EA	-
G	2-2-68	35557	1,4,8	-	EA	-
H	5-29-68	36277	All	All	EA	-
J	12-3-68	37084	3,21	-	EA	-
K	3-11-69	37409	1,2,3,11,21	-	EA	-
L	5-26-70	38132	1, 21	-	EA	-

REFERENCES PS 2015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC.

IMPORTANT: 1. Insure that cable W226 is removed and connector assembly (2003099) or Restart Monitor module (2898989) is connected to the CGC test connector before proceeding with this JDC.

2. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

NOTE: DSKY displays specified in this JDC may in some cases be delayed approximately 15 seconds.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedure contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 30 JUN 66

JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV L PAGE 2 OF 21

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:
None

1. Perform JDC 12215 to establish a Master Initialization condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes on TPA #2 to TB4-43 (high) and TB4-47 (low) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT switch on the Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

4. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 800~ #2.

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:
JDC 12221 CTS UPLINK
Tape, P/N 2901627-001

1. Perform JDC 12215 to establish a Master Initialization condition.

ROLL (OG) CDU AC D/A MONITOR

2. Connect the Buffered Probes on TPA #2 to TB4-43 (high) and TB4-47 (low) to monitor the Roll CDU AC Att Error.

3. Set the VOLTMETER INPUT switch on the Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

4. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 800~ #2.

4A. Prepare the CMC for the UPLINK code by establishing the following conditions on the CTS:

(A) Connect Self Test Assembly, 2014392, to Buffer Box Assembly by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

(B) XY Interface panel -
Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

(C) Programmer and Monitor panel -
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

(D) RDC Interface panel -
Press to light CH33-10 pushbutton.

(E) Tape Reader -
Set Power switch to ON. If alarms occur, press RSET pushbutton on DSKY.

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV L PAGE 3 OF 21

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

5. Perform following DSKY operations:

a.	VERB 21	NOUN 01	ENTR	
b.	01300		ENTR	
c.	30067		ENTR	
d.		NOUN 15	ENTR	
e.	43662		ENTR	ENTR
f.	61426		ENTR	ENTR
g.	10000		ENTR	ENTR
h.	01300		ENTR	ENTR
i.	00033		ENTR	ENTR
j.	01300		ENTR	ENTR
k.	43663		ENTR	ENTR
l.	61426		ENTR	ENTR
m.	10000		ENTR	ENTR
n.	01307		ENTR	ENTR
o.	37633		ENTR	ENTR
p.	01307		ENTR	ENTR
q.	31313		ENTR	ENTR
r.	54026		ENTR	ENTR
s.	54027		ENTR	ENTR

CTS UPLINK TAPE LOAD PROCEDURES

(F) Load the CTS UPLINK tape in the Tape Reader.

(G) Self Test panel -
Press to light SELF TEST pushbutton. Insure that digiswitches on Self Test panel and on Self Test Assembly are set to 00000.

(H) Programmer and Monitor panel -
Press EXECUTE pushbutton.

(I) Verify that the tape advances to the beginning of the first UPLINK code.

(J) Programmer and Monitor panel -
Press EXECUTE pushbutton.

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: The UPLINK ACTY lamp on the DSKY will light during performance of this test.

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JOB SPACECRAFT DISPLAY AND CONTROL TEST

JDC 12221 REV L PAGE 4 OF 21

SUBSYSTEM G & N SYSTEM

ASSY

MANUAL LOAD PROCEDURES

t.	04317		ENTR	ENTR
u.	10067		ENTR	ENTR
v.	01324		ENTR	ENTR
w.	01321		ENTR	ENTR
x.	41305		ENTR	ENTR
y.	60266		ENTR	ENTR
z.	10000		ENTR	ENTR
aa.	01320		ENTR	ENTR
ab.	00000		ENTR	ENTR
ac.	01320		ENTR	ENTR
ad.	01300		ENTR	
ae.	VERB 01	NOUN 01	ENTR	
af.	01300		ENTR	

6. Observe that Row 1 on the DSKY indicates 30067.

7. Enter NOUN 15 and press the ENTR pushbutton on the DSKY.

8. Observe that Row 1 on the DSKY indicates 43662.

9. Press the ENTR pushbutton on the DSKY for each test listed below. For each test, observe that the DSKY Row 1 indicates as specified:

Test	DSKY Row 1 Indication
a.	61426
b.	10000
c.	01300
d.	00033
e.	01300
f.	43663

CTS UPLINK TAPE LOAD PROCEDURES

6. Observe that Row 1 on the DSKY indicates 30067.

7. Press EXECUTE pushbutton on Programmer and Monitor panel.

8. Observe that Row 1 on the DSKY indicates 43662.

9. Press the EXECUTE pushbutton on the Programmer and Monitor panel for each test listed below. For each test, observe that the DSKY Row 1 indicates as specified:

Test	DSKY Row 1 Indication
a.	61426
b.	10000
c.	01300
d.	00033
e.	01300
f.	43663

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MANUAL LOAD PROCEDURES

Test	DSKY Row 1 Indication
g.	61426
h.	10000
i.	01307
j.	37633
k.	01307
l.	31313
m.	54026
n.	54027
o.	04317
p.	10067
q.	01324
r.	01321
s.	41305
t.	60266
u.	10000
v.	01320
w.	00000
x.	01320
y.	01300

10. Perform following DSKY operations:

a. VERB 25 NOUN 26 ENTR
b. 02000 ENTR
c. 01321 ENTR
d. 12007 ENTR

11. Observe that Row 1, Row 2, and Row 3 on the DSKY indicate as follows:

a. Row 1 displays 02000
b. Row 2 displays 01321
c. Row 3 displays 12007

CTS UPLINK TAPE LOAD PROCEDURES

Test	DSKY Row 1 Indication
g.	61426
h.	10000
i.	01307
j.	37633
k.	01307
l.	31313
m.	54026
n.	54027
o.	04317
p.	10067
q.	01324
r.	01321
s.	41305
t.	60266
u.	10000
v.	01320
w.	00000
x.	01320
y.	01300

10. Press EXECUTE pushbutton on Programmer and Monitor panel.

11. Observe that Row 1, Row 2, and Row 3 on the DSKY indicate as follows:

a. Row 1 displays 02000
b. Row 2 displays 01321
c. Row 3 displays 12007

MANUAL LOAD PROCEDURES

12. Enter VERB 30 and press ENTR pushbutton on the DSKY.

13. Perform following DSKY operations:

a. VERB 57 ENTR
b. 00013 ENTR

14. Observe that the DSKY displays the following:

a. PROG displays 07
b. VERB 06 NOUN 01 Flashing
c. NO ATT lamp lights
d. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

15. Enter VERB 33 and press ENTR pushbutton on the DSKY.

16. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. NO ATT lamp goes out.

Record the PAVM voltage indication and sign.

17. Enter VERB 33 and press ENTR pushbutton on the DSKY.

18. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Row 3 displays +00384

Record the PAVM voltage indication and sign.

CTS UPLINK TAPE LOAD PROCEDURES

12. Press EXECUTE pushbutton on Programmer and Monitor panel.

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

14. Observe that the DSKY displays the following:

a. PROG displays 07
b. VERB 06 NOUN 01 Flashing
c. NO ATT lamp lights
d. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

15. Press EXECUTE pushbutton on Programmer and Monitor panel.

16. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. NO ATT lamp goes out.

Record the PAVM voltage indication and sign.

17. Press EXECUTE pushbutton on Programmer and Monitor panel.

18. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00384
c. Row 2 displays -00384
d. Row 3 displays +00384

Record the PAVM voltage indication and sign.

MANUAL LOAD PROCEDURES

19. Enter VERB 33 and press ENTR pushbutton on the DSKY.

20. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160
d. Row 3 displays +00160

Record the PAVM voltage indication and sign.

21. Enter VERB 33 and press ENTR pushbutton on the DSKY.

22. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135
d. Row 3 displays +00135

Record the PAVM voltage indication and sign. Determine and record the phase angle of the signal.

23. Enter VERB 33 and press ENTR pushbutton on the DSKY.

24. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090
d. Row 3 displays +00090

Record the PAVM voltage indication and sign.

25. Enter VERB 33 and press ENTR pushbutton on the DSKY.

26. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

CTS UPLINK TAPE LOAD PROCEDURES

19. Press EXECUTE pushbutton on Programmer and Monitor panel.

20. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160
d. Row 3 displays +00160

Record the PAVM voltage indication and sign.

21. Press EXECUTE pushbutton on Programmer and Monitor panel.

22. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135
d. Row 3 displays +00135

Record the PAVM voltage indication and sign. Determine and record the phase angle of the signal.

23. Press EXECUTE pushbutton on Programmer and Monitor panel.

24. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090
d. Row 3 displays +00090

Record the PAVM voltage indication and sign.

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

26. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing

MANUAL LOAD PROCEDURES

b. Row 1 displays +00000
c. Row 2 displays +00000
d. Row 3 displays -00090

Record the PAVM voltage indication and sign.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090
d. Row 3 displays -00135

Record the PAVM voltage indication and sign.

29. Enter VERB 33 and press ENTR pushbutton on the DSKY.

30. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135
d. Row 3 displays -00160

Record the PAVM voltage indication and sign.

31. Enter VERB 33 and press ENTR pushbutton on the DSKY.

32. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160
d. Row 3 displays -00384

Record the PAVM voltage indication and sign.

CTS UPLINK TAPE LOAD PROCEDURES

b. Row 1 displays +00000
c. Row 2 displays +00000
d. Row 3 displays -00090

Record the PAVM voltage indication and sign.

27. Press EXECUTE pushbutton on Programmer and Monitor panel.

28. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090
d. Row 3 displays -00135

Record the PAVM voltage indication and sign.

29. Press EXECUTE pushbutton on Programmer and Monitor panel.

30. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135
d. Row 3 displays -00160

Record the PAVM voltage indication and sign.

31. Press EXECUTE pushbutton on Programmer and Monitor panel.

32. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160
d. Row 3 displays -00384

Record the PAVM voltage indication and sign.

MANUAL LOAD PROCEDURES

33. Enter VERB 33 and press ENTR pushbutton on the DSKY.

34. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384
d. Row 3 displays -00385

Record the PAVM voltage indication and sign.

35. Enter VERB 33 and press ENTR pushbutton on the DSKY.

36. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385
d. Row 3 displays +00000

Record the PAVM voltage indication and sign.

37. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

38. Connect the Direct Probes to TB4-34 (high) and TB4-38 (low) on TPA #2 to monitor the Roll CDU DC D/A output.

39. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and set the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the Digital Voltmeter (DVM) to DC VOLTS.

S/C CONTROL OF SATURN TEST

40. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

33. Press EXECUTE pushbutton on Programmer and Monitor panel.

34. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384
d. Row 3 displays -00385

Record the PAVM voltage indication and sign.

35. Press EXECUTE pushbutton on Programmer and Monitor panel.

36. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385
d. Row 3 displays +00000

Record the PAVM voltage indication and sign.

37. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall light.

ROLL (OG) CDU DC D/A MONITOR

38. Connect the Direct Probes to TB4-34 (high) and TB4-38 (low) on TPA #2 to monitor the Roll CDU DC D/A output.

39. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and set the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the Digital Voltmeter (DVM) to DC VOLTS.

S/C CONTROL OF SATURN TEST

40. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

41. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

42. Enter VERB 33 and press ENTR pushbutton on the DSKY.

43. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

44. Enter VERB 33 and press ENTR pushbutton on the DSKY.

45. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

46. Repeat steps 17 through 36 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash on the DSKY during performance of these steps. Exclude phase angle measurement in step 22.

47. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

41. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

42. Press EXECUTE pushbutton on Programmer and Monitor panel.

43. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

44. Press EXECUTE pushbutton on Programmer and Monitor panel.

45. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00385
e. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

46. Repeat steps 17 through 36 measuring the voltages on the DVM rather than PAVM. Note that VERB 06 and NOUN 02 shall flash on the DSKY during performance of these steps. Exclude phase angle measurement in step 22.

47. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

48. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

YAW TVC MONITOR

49. Connect the Direct Probes to TB4-29 (high) and TB4-33 (low) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

50. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS, and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

NOTE: Deleted

51. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

CTS UPLINK TAPE LOAD PROCEDURES

48. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

YAW TVC MONITOR

49. Connect the Direct Probes to TB4-29 (high) and TB4-33 (low) on TPA #2 to monitor the Yaw TVC output.

TVC TEST

50. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel, the CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS, and the GN&C A/P CONTROL pushbutton on the Test Control panel in that order. The CH30-3/IN0-3 and GN&C A/P CONTROL pushbuttons shall light. The S/C CONTROL OF SATURN pushbutton shall not be lighted.

NOTE: Deleted

51. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

MANUAL LOAD PROCEDURES

52. Enter VERB 33 and press ENTR pushbutton on the DSKY.

53. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X7373
c. Row 3 displays 00030

54. Enter VERB 33 and press ENTR pushbutton on the DSKY.

55. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays 37777
c. Row 3 displays 00031

56. Enter VERB 33 and press ENTR pushbutton on the DSKY.

57. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00003

Record the DVM voltage indication and sign.

NOTE: Row 3 of the DSKY shall display +00003 until completion of step 79.

58. Enter VERB 33 and press ENTR pushbutton on the DSKY.

59. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00384

CTS UPLINK TAPE LOAD PROCEDURES

52. Press EXECUTE pushbutton on Programmer and Monitor panel.

53. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X7373
c. Row 3 displays 00030

54. Press EXECUTE pushbutton on Programmer and Monitor panel.

55. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays 37777
c. Row 3 displays 00031

56. Press EXECUTE pushbutton on Programmer and Monitor panel.

57. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00385
c. Row 2 displays -00385
d. Row 3 displays +00003

Record the DVM voltage indication and sign.

NOTE: Row 3 of the DSKY shall display +00003 until completion of step 79.

58. Press EXECUTE pushbutton on Programmer and Monitor panel.

59. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00384

MANUAL LOAD PROCEDURES

c. Row 2 displays -00384
d. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

60. Press VERB 33 and press ENTR pushbutton on the DSKY.

61. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160

Record the DVM voltage indication and sign.

62. Enter VERB 33 and press ENTR pushbutton on the DSKY.

63. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135

Record the DVM voltage indication and sign.

64. Enter VERB 33 and press ENTR pushbutton on the DSKY.

65. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090

Record the DVM voltage indication and sign.

66. Set OPTICS SPEED switch on Indicator Control panel to HI.

67. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

c. Row 2 displays -00384
d. NO ATT lamp goes out.

Record the DVM voltage indication and sign.

60. Press EXECUTE pushbutton on Programmer and Monitor panel.

61. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00160
c. Row 2 displays -00160

Record the DVM voltage indication and sign.

62. Press EXECUTE pushbutton on Programmer and Monitor panel.

63. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00135
c. Row 2 displays -00135

Record the DVM voltage indication and sign.

64. Press EXECUTE pushbutton on Programmer and Monitor panel.

65. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00090
c. Row 2 displays -00090

Record the DVM voltage indication and sign.

66. Set OPTICS SPEED switch on Indicator Control panel to HI.

67. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

68. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000

While holding the Optics Hand Controller on the Indicator Control panel up and left (45°) no longer than 10 seconds, record the DVM voltage indication and sign.

69. Enter VERB 33 and press ENTR pushbutton on the DSKY.

70. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090

Record the DVM voltage indication and sign.

CAUTION: The TRUNNION TPAC on the OUA must indicate between 0 and 10 degrees before the OUA is commanded to zero. Manipulate the Optics Hand Controller on the Indicator Control panel vertically to drive the trunnion axis in a decreasing direction until the TRUNNION TPAC indicates between 0 and 10 degrees. The OPTICS SPEED switch may be adjusted to facilitate positioning the trunnion axis. Do not drive the trunnion axis through zero to the negative limit stop.

CTS UPLINK TAPE LOAD PROCEDURES

68. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays +00000
c. Row 2 displays +00000

While holding the Optics Hand Controller on the Indicator Control panel up and left (45°) no longer than 10 seconds, record the DVM voltage indication and sign.

69. Press EXECUTE pushbutton on Programmer and Monitor panel.

70. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00090
c. Row 2 displays +00090

Record the DVM voltage indication and sign.

CAUTION: The TRUNNION TPAC on the OUA must indicate between 0 and 10 degrees before the OUA is commanded to zero. Manipulate the Optics Hand Controller on the Indicator Control panel vertically to drive the trunnion axis in a decreasing direction until the TRUNNION TPAC indicates between 0 and 10 degrees. The OPTICS SPEED switch may be adjusted to facilitate positioning the trunnion axis. Do not drive the trunnion axis through zero to the negative limit stop.

MANUAL LOAD PROCEDURES

71. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

72. Enter VERB 33 and press ENTR pushbutton on the DSKY.

73. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135

Record the DVM voltage indication and sign.

74. Enter VERB 33 and press ENTR pushbutton on the DSKY.

75. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160

Record the DVM voltage indication and sign.

76. Enter VERB 33 and press ENTR pushbutton on the DSKY.

77. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384

Record the DVM voltage indication and sign.

CTS UPLINK TAPE LOAD PROCEDURES

71. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO for 20 seconds then return to OFF. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO for 20 seconds then return to MAN.

72. Press EXECUTE pushbutton on Programmer and Monitor panel.

73. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00135
c. Row 2 displays +00135

Record the DVM voltage indication and sign.

74. Press EXECUTE pushbutton on Programmer and Monitor panel.

75. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00160
c. Row 2 displays +00160

Record the DVM voltage indication and sign.

76. Press EXECUTE pushbutton on Programmer and Monitor panel.

77. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00384
c. Row 2 displays +00384

Record the DVM voltage indication and sign.

MANUAL LOAD PROCEDURES

78. Enter VERB 33 and press ENTR pushbutton on the DSKY.

79. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385

Record the DVM voltage indication and sign.

TEST ABORT AND RESTART

80. Enter VERB 34 and press ENTR pushbutton on the DSKY.

81. Observe that the DSKY PROG display indicates 00.

82. Enter VERB 57 and press ENTR pushbutton on the DSKY.

83. Observe that VERB 21 NOUN 01 is flashing on the DSKY.

84. Enter 00013 and press ENTR pushbutton on the DSKY.

85. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. NO ATT lamp lights
c. PROG displays 07
d. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

86. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall go out.

CTS UPLINK TAPE LOAD PROCEDURES

78. Press EXECUTE pushbutton on Programmer and Monitor panel.

79. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. Row 1 displays -00385
c. Row 2 displays +00385

Record the DVM voltage indication and sign.

TEST ABORT AND RESTART

80. Press EXECUTE pushbutton on Programmer and Monitor panel.

81. Observe that the DSKY PROG display indicates 00.

82. Press EXECUTE pushbutton on Programmer and Monitor panel.

83. Observe that VERB 21 NOUN 01 is flashing on the DSKY.

84. Press EXECUTE pushbutton on Programmer and Monitor panel.

85. Observe that the DSKY displays the following:

a. VERB 06 NOUN 01 Flashing
b. NO ATT lamp lights
c. PROG displays 07
d. Row 1, Row 2, and R3 indicate approximately 0° Gimbal angles.

86. Press CH30-3/IN0-3 pushbutton on the RDC Interface panel of the CTS. Press the GN&C A/P CONTROL pushbutton on the Test Control panel. The pushbuttons shall go out.

MANUAL LOAD PROCEDURES

PITCH (IG) CDU AC D/A MONITOR

87. Connect the Buffered Probes to TB4-45 (high) and TB4-49 (low) on TPA #2 to monitor the Pitch CDU AC Att Error.

88. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

ATTITUDE ERROR (FDAI) TEST

89. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.

PITCH (IG) CDU DC D/A MONITOR

90. Connect the Direct Probes to TB4-36 (high) and TB4-40 (low) on TPA #2 to monitor the Pitch CDU DC D/A output.

91. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on DVM to DC VOLTS.

S/C CONTROL OF SATURN TEST

92. Enter VERB 33 and press ENTR pushbutton on the DSKY.

93. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

94. Enter VERB 33 and press ENTR pushbutton on the DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

PITCH (IG) CDU AC D/A MONITOR

87. Connect the Buffered Probes to TB4-45 (high) and TB4-49 (low) on TPA #2 to monitor the Pitch CDU AC Att Error.

88. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

ATTITUDE ERROR (FDAI) TEST

89. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.

PITCH (IG) CDU DC D/A MONITOR

90. Connect the Direct Probes to TB4-36 (high) and TB4-40 (low) on TPA #2 to monitor the Pitch CDU DC D/A output.

91. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on DVM to DC VOLTS.

S/C CONTROL OF SATURN TEST

92. Press EXECUTE pushbutton on Programmer and Monitor panel.

93. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

94. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

95. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

96. Enter VERB 33 and press ENTR pushbutton on the DSKY.

97. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp goes out
c. Row 1 displays +00385
d. Row 2 displays -00385
e. Row 3 displays +00385

Record the DVM voltage indication and sign.

98. Repeat steps 17 through 36 measuring the voltages on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.

99. Enter VERB 33 and press ENTR pushbutton on the DSKY.

100. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

PITCH TVC MONITOR

101. Connect the Direct Probes to TB4-28 (high) and TB4-32 (low) on TPA #2 to monitor the Pitch TVC output.

CTS UPLINK TAPE LOAD PROCEDURES

95. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

96. Press EXECUTE pushbutton on Programmer and Monitor panel.

97. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp goes out
c. Row 1 displays +00385
d. Row 2 displays -00385
e. Row 3 displays +00385

Record the DVM voltage indication and sign.

98. Repeat steps 17 through 36 measuring the voltages on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.

99. Press EXECUTE pushbutton on Programmer and Monitor panel.

100. Observe that the DSKY displays the following:

a. VERB 06 NOUN 03 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

PITCH TVC MONITOR

101. Connect the Direct Probes to TB4-28 (high) and TB4-32 (low) on TPA #2 to monitor the Pitch TVC output.

MANUAL LOAD PROCEDURES

TVC TEST

102. Repeat steps 50 through 86.

YAW (MG) CDU AC D/A MONITOR

103. Connect the Buffered Probes to TB4-44 (high) and TB4-48 (low) on TPA #2 to monitor the Yaw CDU AC Att Error.

104. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

ATTITUDE ERROR (FDAI) TEST

105. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.

YAW (MG) CDU DC D/A MONITOR

106. Connect the Direct Probes to TB4-35 (high) and TB4-39 (low) on TPA #2 to monitor the Yaw CDU DC D/A output.

107. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the DVM to DC VOLTS.

S/C CONTROL OF SATURN TEST

108. Enter VERB 33 and press ENTR pushbutton on the DSKY.

109. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

CTS UPLINK TAPE LOAD PROCEDURES

TVC TEST

102. Repeat steps 50 through 86.

YAW (MG) CDU AC D/A MONITOR

103. Connect the Buffered Probes to TB4-44 (high) and TB4-48 (low) on TPA #2 to monitor the Yaw CDU AC Att Error.

104. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to PAVM SIG 1 and the CROSSBAR CONTROL to 99.

ATTITUDE ERROR (FDAI) TEST

105. Repeat steps 15 through 37. Determine and record the phase angle of signal in step 22.

YAW (MG) CDU DC D/A MONITOR

106. Connect the Direct Probes to TB4-35 (high) and TB4-39 (low) on TPA #2 to monitor the Yaw CDU DC D/A output.

107. Set the VOLTMETER INPUT switch on Primary Signal Selector panel to DVM SIG 2 and the CROSSBAR CONTROL to 99. Set the FUNCTION switch on the DVM to DC VOLTS.

S/C CONTROL OF SATURN TEST

108. Press EXECUTE pushbutton on Programmer and Monitor panel.

109. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp lights
c. Row 1, Row 2, and Row 3 indicate approximately 0° Gimbal angles.

MANUAL LOAD PROCEDURES

110. Enter VERB 33 and press ENTR pushbutton on the DSKY.

111. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

112. Enter VERB 33 and press ENTR pushbutton on the DSKY.

113. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp goes out
c. Row 1 displays +00385
d. Row 2 displays -00385
e. Row 3 displays +00385

Record the DVM voltage indication and sign.

114. Repeat steps 17 through 36 measuring the voltage on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.

TEST ABORT

115. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall go out.

116. Enter VERB 34 and press ENTR pushbutton on the DSKY.

117. Observe that NO ATT lamp on DSKY is not lighted.

CTS UPLINK TAPE LOAD PROCEDURES

110. Press EXECUTE pushbutton on Programmer and Monitor panel.

111. Observe that the DSKY displays the following:

a. VERB 01 NOUN 10 Flashing
b. Row 1 displays X6377
c. Row 3 displays 00030

112. Press EXECUTE pushbutton on Programmer and Monitor panel.

113. Observe that the DSKY displays the following:

a. VERB 06 NOUN 02 Flashing
b. NO ATT lamp goes out
c. Row 1 displays +00385
d. Row 2 displays -00385
e. Row 3 displays +00385

Record the DVM voltage indication and sign.

114. Repeat steps 17 through 36 measuring the voltage on DVM rather than PAVM. Note that VERB 06 NOUN 02 shall flash during performance of these steps. Exclude phase angle measurement in step 22.

TEST ABORT

115. Press the S/C CONTROL OF SATURN pushbutton on the Test Control panel. The pushbutton shall go out.

116. Press EXECUTE pushbutton on Programmer and Monitor panel.

117. Observe that NO ATT lamp on DSKY is not lighted.

JOB SPACECRAFT DISPLAY AND CONTROL TEST | JDC 12221 REV L PAGE 21 OF 21

SUBSYSTEM G & N SYSTEM | ASSY

MANUAL LOAD PROCEDURES

118. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

119. Enter VERB 36 and press ENTR pushbutton on the DSKY.

NOTE: Step 119A applies only when Restart Monitor module (2898989) is installed.

119A. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

CTS UPLINK TAPE LOAD PROCEDURES

118. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

119. Press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Step 119A applies only when Restart Monitor module (2898989) is installed.

119A. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

120. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

121. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

122. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

123. Rewind and remove tape from Tape Reader and set Power switch to OFF. If alarms occur, press RSET pushbutton on DSKY.

124. Disconnect Self Test Assembly from Buffer Box Assembly.

125. Press to extinguish SELF TEST pushbutton on Self Test panel.

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12221
REV. L
INITIAL TDRR 29882

JOB SPACECRAFT CONTROL AND DISPLAY TEST

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16	Roll Att Error +00385	vac	+4.40		+5.72		
18	Roll Att Error +00384	vac	+4.40		+5.72		
20	Roll Att Error +00160	vac	+1.84		+2.38		
22	Roll Att Error +00135	vac	+1.55		+2.01		
	Roll Att Error Phase Angle	deg	-8.0		+8.0		
24	Roll Att Error +00090	vac	+1.04		+1.34		
26	Roll Att Error +00000	vac	-0.056		+0.056		
28	Roll Att Error -00090	vac	-1.04		-1.34		
30	Roll Att Error -00135	vac	-1.55		-2.01		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12221
REV. L

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
32	Roll Att Error -00160	vac	-1.84		-2.38		
34	Roll Att Error -00384	vac	-4.40		-5.72		
36	Roll Att Error -00385	vac	-4.40		-5.72		
45	Roll S/C - Saturn +00385	vdc	+4.98		+5.60		
46 (18)	Roll S/C - Saturn +00384	vdc	+4.98		+5.60		
46 (20)	Roll S/C - Saturn +00160	vdc	+2.07		+2.34		
46 (22)	Roll S/C - Saturn +00135	vdc	+1.75		+1.98		
46 (24)	Roll S/C - Saturn +00090	vdc	+1.17		+1.32		
46 (26)	Roll S/C - Saturn +00000	vdc	-0.01		+0.01		
46 (28)	Roll S/C - Saturn -00090	vdc	-1.17		-1.32		
46 (30)	Roll S/C - Saturn -00135	vdc	-1.75		-1.98		
46 (32)	Roll S/C - Saturn -00160	vdc	-2.07		-2.34		
46 (34)	Roll S/C - Saturn -00384	vdc	-4.98		-5.60		
46 (36)	Roll S/C - Saturn -00385	vdc	-4.98		-5.60		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12221
REV. L

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
57	Yaw TVC +00385	vdc	+4.76		+5.36		
59	Yaw TVC +00384	vdc	+4.76		+5.36		
61	Yaw TVC +00160	vdc	+1.98		+2.24		
63	Yaw TVC +00135	vdc	+1.67		+1.89		
65	Yaw TVC +00090	vdc	+1.12		+1.26		
68	Yaw TVC +00000	vdc	-0.01		+0.01		
70	Yaw TVC -00090	vdc	-1.12		-1.26		
73	Yaw TVC -00135	vdc	-1.67		-1.89		
75	Yaw TVC -00160	vdc	-1.98		-2.24		
77	Yaw TVC -00384	vdc	-4.76		-5.36		
79	Yaw TVC -00385	vdc	-4.76		-5.36		
89 (16)	Pitch Att Error -00385	vac	-4.40		-5.72		
89 (18)	Pitch Att Error -00384	vac	-4.40		-5.72		
89 (20)	Pitch Att Error -00160	vac	-1.84		-2.38		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12221
REV. L

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
89 (22)	Pitch Att Error -00135	vac	-1.55		-2.01		
	Pitch Att Error Phase Angle	deg	+172.0		+188.0		
89 (24)	Pitch Att Error -00090	vac	-1.04		-1.34		
89 (26)	Pitch Att Error +00000	vac	-0.056		+0.056		
89 (28)	Pitch Att Error +00090	vac	+1.04		+1.34		
89 (30)	Pitch Att Error +00135	vac	+1.55		+2.01		
89 (32)	Pitch Att Error +00160	vac	+1.84		+2.38		
89 (34)	Pitch Att Error +00384	vac	+4.40		+5.72		
89 (36)	Pitch Att Error +00385	vac	+4.40		+5.72		
97	Pitch S/C - Saturn -00385	vdc	-4.98		-5.60		
98 (18)	Pitch S/C - Saturn -00384	vdc	-4.98		-5.60		
98 (20)	Pitch S/C - Saturn -00160	vdc	-2.07		-2.34		
98 (22)	Pitch S/C - Saturn -00135	vdc	-1.75		-1.98		
98 (24)	Pitch S/C - Saturn -00090	vdc	-1.17		-1.32		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC
NO. 12221
REV. L

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
98 (26)	Pitch S/C - Saturn -00000	vdc	-0.01		+0.01		
98 (28)	Pitch S/C - Saturn +00090	vdc	+1.17		+1.32		
98 (30)	Pitch S/C - Saturn +00135	vdc	+1.75		+1.98		
98 (32)	Pitch S/C - Saturn +00160	vdc	+2.07		+2.34		
98 (34)	Pitch S/C - Saturn +00384	vdc	+4.98		+5.60		
98 (36)	Pitch S/C - Saturn +00385	vdc	+4.98		+5.60		
102 (57)	Pitch TVC -00385	vdc	-4.76		-5.36		
102 (59)	Pitch TVC -00384	vdc	-4.76		-5.36		
102 (61)	Pitch TVC -00160	vdc	-1.98		-2.24		
102 (63)	Pitch TVC -00135	vdc	-1.67		-1.89		
102 (65)	Pitch TVC -00090	vdc	-1.12		-1.26		
(102 (68)	Pitch TVC +00000	vdc	-0.01		+0.01		
102 (70)	Pitch TVC +00090	vdc	+1.12		+1.26		
102 (73)	Pitch TVC +00135	vdc	+1.67		+1.89		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC
NO. 12221
REV. L

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
102 (75)	Pitch TVC +00160	vdc	+1.98		+2.24		
102 (77)	Pitch TVC +00384	vdc	+4.76		+5.36		
102 (79)	Pitch TVC +00385	vdc	+4.76		+5.36		
105 (16)	Yaw Att Error +00385	vac	+4.40		+5.72		
105 (18)	Yaw Att Error +00384	vac	+4.40		+5.72		
105 (20)	Yaw Att Error +00160	vac	+1.84		+2.38		
105 (22)	Yaw Att Error +00135	vac	+1.55		+2.01		
	Yaw Att Error Phase Angle	deg	-8.0		+8.0		
105 (24)	Yaw Att Error +00090	vac	+1.04		+1.34		
105 (26)	Yaw Att Error -00090	vac	-1.04		-1.34		
105 (28)	Yaw Att Error -00135	vac	-1.55		-2.01		
105 (30)	Yaw Att Error -00160	vac	-1.84		-2.38		
105 (32)	Yaw Att Error -00384	vac	-4.40		-5.72		
105 (34)	Yaw Att Error -00385	vac	-4.40		-5.72		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC
NO. 12221
REV. L

JOB SPACECRAFT CONTROL AND DISPLAY TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
105 (36)	Yaw Att Error +00000	vac	-0.056		+0.056		
113	Yaw S/C - Saturn +00385	vdc	+4.98		+5.60		
114 (18)	Yaw S/C - Saturn +00384	vdc	+4.98		+5.60		
114 (20)	Yaw S/C - Saturn +00160	vdc	+2.07		+2.34		
114 (22)	Yaw S/C - Saturn +00135	vdc	+1.75		+1.98		
114 (24)	Yaw S/C - Saturn +00090	vdc	+1.17		+1.32		
114 (26)	Yaw S/C - Saturn -00090	vdc	-1.17		-1.32		
114 (28)	Yaw S/C - Saturn -00135	vdc	-1.75		-1.98		
114 (30)	Yaw S/C - Saturn -00160	vdc	-2.07		-2.34		
114 (32)	Yaw S/C - Saturn -00384	vdc	-4.98		-5.60		
114 (34)	Yaw S/C - Saturn -00385	vdc	-4.98		-5.60		
114 (36)	Yaw S/C - Saturn +00000	vdc	-0.01		+0.01		

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JOB GYRO COMPASSING
JDC 12222 REV. A PAGE 1 OF 4
INITIAL TDRR 29882 D.S. PGS 8

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	7-28-66	30311	2,4	1-6	EA	WS	
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

DESCRIPTION. This procedure tests the Gyro Compassing capabilities of the G & N System. The test is is computer controlled. The system is erected with the X Gyro Northeast, the Y Gyro Southeast, and the Z Gyro down. The output of the X and Y PIPA's is used to hold the platform vertical. The Y PIPA and X Gyro comprise the compassing loop. The X and Y gyro elevation errors and the Z gyro azimuth error are checked after a two hour settling period and every 15 minutes thereafter for a period of 3 hours, using optical verification. The test takes approximately 5 hours to perform. From the third to the fourth hour, the prime power is set to the LO limit. From the fourth to the fifth hour the prime power is set to the HI limit.

INITIALIZATION

1. Establish a Master Initialization Condition.

VOLTAGE SETTING (NOMINAL)

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB GYRO COMPASSING
JDC 12222 REV A PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM
ASSY

the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±05) vdc. Record the indication.

TEST ENTRY

3. Perform the following DSKY operations:

VERB 57 ENTR
00006 ENTR

Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of the DSKY displays +04500. If the display is correct proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations. To change only Row 1:

VERB 21 ENTR
+04500 ENTR

6. Perform the following DSKY operation:

VERB 33 ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +XX.XXX (Test site latitude from Table 1)

If the display is correct proceed to step 9, if not proceed to step 8.

8. Perform the following DSKY operations. To change only Row 1:

VERB 21 ENTR
+18000 ENTR

To change only Row 2

VERB 22 ENTR
+XX.XXX (Test site latitude from Table 1) ENTR

9. Perform the following DSKY operations:

VERB 33 ENTR

Observe the PROG lamp changes to 01 for approximately 90 seconds then to 05 for approximately 15 minutes, then to 02 for the duration of this test.

TEST RESULTS AT 2 HRS

10. After 120 minutes have elapsed since initiation of step 9, set the OPTICS MODE switch on the Indicator Control panel to ZERO.

11. Perform the following DSKY operations:

Enter VERB 52 ENTR

Observe the PROG lamp changes to 03.

TARGET #1 AZ AND ELEV

12. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +00000

If the display is correct proceed to step 14, if not, proceed to step 13.

13. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24 ENTR
+18000 ENTR
+00000 ENTR

14. Perform the following DSKY operation:

VERB 33 ENTR

TARGET #4 AZ AND ELEV

15. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +13500
Row 2 displays +00000

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JOB GYRO COMPASSING
JDC 12222 REV A PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM
ASSY

If display is correct proceed to step 17, if not, proceed to step 16.

16. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24 ENTR
+13500 ENTR
+00000 ENTR

17. Perform the following DSKY operations:

VERB 33 ENTR

MARK ON TARGET #1

18. Set the OPTICS MODE switch on the Indicator Control panel to MAN and the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 180.0° and 32.5° respectively.

19. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If MARK was satisfactory, proceed to the next step, if not press MARK REJECT and repeat this step.

MARK ON TARGET #4

20. Set the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

21. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton. If MARK was satisfactory, press ENTR and proceed to the next step, if not, press MARK REJECT and repeat this step.

X, Y, Z GYRO ERRORS

22. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

23. Perform the following DSKY operations:

VERB 34 ENTR

Observe the PROG lamp changes to 02. Set the OPTICS MODE switch to ZERO.

24. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

25. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 25.8 (+0.25, -0 vdc). Record the indication.

26. Repeat step 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 31.8 (+0, -0.25 vdc). Record the indication.

28. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

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JOB GYRO COMPASSING
JDC 12222 REV A PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM
ASSY

29. Perform the following DSKY operations:

VERB 36 ENTR

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc.

31. Perform the calculations on the calculation sheet and complete the data sheets.

32. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development
DIV #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

Table 1

Latitude of Test Site

Location	Latitude λ	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
MILA	28.516	.82868
NAA	33.917	.82985

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8
JOB GYRO COMPASSING

NO. 12222 JDC
REV. A
INITIAL TDRR 29882

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2	IMU OPERATE BUS, 28VDC	volts dc	28.3		29.3			a
22	X Gyro elevation error Row 1 (+ 2 HRS)	degrees	-.03	( ) __.___	+.03			b
	Y Gyro elevation error Row 2 (+ 2 HRS)	degrees	-.03	( ) __.___	+.03			c
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			d
24 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			e
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			f

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. A

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			g
24 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			h
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			i
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			j
24 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			k
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			l
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			m
24 (60 min)	X Gyro elevation error Row 2 (+ 3 HRS)	degrees	▨	( ) __.___	▨			n

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. A

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2 (+ 3 HRS)	degrees	▨	( ) __.___	▨			o
	Z Gyro azimuth error Row 3 (+ 3 HRS)	degrees	▨	( ) __.___	▨			p
25	IMU OPERATE BUS 28 VDC	volts dc	25.8		26.05			q
26 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			r
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			s
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			t
26 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			u
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			v
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			w

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. A

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
26 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			x
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			y
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			z
26 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			aa
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ab
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ac
27	IMU OPERATE BUS 28 VDC	volts dc	31.55		31.8			ad
28 (15 min)	X Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ae

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12222
REV. A

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			af
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ag
28 (30 min)	X Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ah
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ai
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			aj
28 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			ak
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			al
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			am

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
NO. 12222
REV. A

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			an
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ao
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ap
31	Azimuth error contributed by IRIG coefficients	degrees	▨		▨			aq
31a	Z Gyro azimuth error (corrected) +2 HRS	degrees	-.57		+.57			ar
31b	ΔX Gyro elevation error +3 HRS	degrees	-.02		+.02			as
31c	ΔY Gyro elevation error +3 HRS	degrees	-.02		+.02			at
31d	ΔZ Gyro azimuth error +3 HRS	degrees	-.06		+.06			au
31e	ΔX Gyro elevation error +4 HRS (LO BUS)	degrees	-.02		+.02			av

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 8

JDC
NO. 12222
REV. A

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
31f	ΔY Gyro elevation error +4 HRS (LO BUS)	degrees	-.02		+.02			aw
31g	ΔZ Gyro azimuth error +4 HRS (LO BUS)	degrees	-.06		+.06			ax
31h	ΔX Gyro elevation error +5 HRS (HI BUS)		▨		▨			ay
31i	ΔY Gyro elevation error +5 HRS (HI BUS)		▨		▨			az
31j	ΔZ Gyro azimuth error +5 HRS (HI BUS)		▨		▨			ba

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 8

JDC
NO. 12222
REV. A

JOB GYRO COMPASSING

CALCULATIONS SHEET

Record the latest values of the following coefficients from JDC 12217.

NBDX ( ) ____________
NBDY ( ) ____________
NBDZ ( ) ____________
ADIAZ ( ) ____________
ADSRAY ( ) ____________

Perform the following calculations. Cos λ functions are provided in table 1.

Drift (vert) = NDBZ + ADIAZ
Drift (vert) = ( ) ____________ meru
Drift (east) = .707(NBDY + NBDX + ADSRAY)
Drift (east) = ( ) ____________ meru

IRIG COEFFICIENT AZ ERROR CONTRIBUTION

$$\phi\,(\text{vert}) = \frac{D(\text{vert}) \times \frac{24.2}{\cos\lambda} + D(\text{east}) \times \frac{206}{\cos\lambda}}{3600}$$

ϕ (vert) = ( ) ____________ degrees

Record answer on line aq.

Perform the following calculations

a. line d - line aq record on line ar
b. line b - line n record on line as
c. line c - line o record on line at
d. line d - line p record on line au
e. line b - line aa record on line av
f. line c - line ab record on line aw
g. line d - line ac record on line ax
h. line b - line an record on line ay
i. line c - line ao record on line az
j. line d - line ap record on line ba

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JOB GYRO COMPASSING

JDC 12222 REV. B PAGE 1 OF 4
INITIAL TDRR 29882 D.S. PGS 8

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
Ⓜ A	7-28-66	30311	2,4	1-6	FA	WS
B	9-1-66	30926	2,4	-	JP	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the Gyro Compassing capabilities of the G & N System. The test is is computer controlled. The system is erected with the X Gyro Northeast, the Y Gyro Southeast, and the Z Gyro down. The output of the X and Y PIPA's is used to hold the platform vertical. The Y PIPA and X Gyro comprise the compassing loop. The X and Y gyro elevation errors and the Z gyro azimuth error are checked after a two hour settling period and every 15 minutes thereafter for a period of 3 hours, using optical verification. The test takes approximately 5 hours to perform. From the third to the fourth hour, the prime power is set to the LO limit. From the fourth to the fifth hour the prime power is set to the HI limit.

INITIALIZATION

1. Establish a Master Initialization Condition.

VOLTAGE SETTING (NOMINAL)

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±05) vdc. Record the indication.

TEST ENTRY

3. Perform the following DSKY operations:

VERB 57 ENTR
00006 ENTR

Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of the DSKY displays +04500. If the display is correct proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations. To change only Row 1:

VERB 21 ENTR
+04500 ENTR

6. Perform the following DSKY operation:

VERB 33 ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +XX.XXX (Test site latitude from Table 1)

If the display is correct proceed to step 9, if not proceed to step 8.

8. Perform the following DSKY operations. To change only Row 1:

VERB 21 ENTR
+18000 ENTR

To change only Row 2

VERB 22 ENTR
+XX.XXX (Test site latitude from Table 1) ENTR

9. Perform the following DSKY operations:

VERB 33 ENTR

Observe the PROG lamp remains at 01 for approximately 90 seconds then to 05 for approximately 15 minutes, then to 02 for the duration of this test.

TEST RESULTS AT 2 HRS

10. After 120 minutes have elapsed since initiation of step 9, set the OPTICS MODE switch on the Indicator Control panel to ZERO.

11. Perform the following DSKY operations:

Enter VERB 52 ENTR

Observe the PROG lamp changes to 03.

TARGET #1 AZ AND ELEV

12. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +00000

If the display is correct proceed to step 14, if not, proceed to step 13.

13. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24 ENTR
+18000 ENTR
+00000 ENTR

14. Perform the following DSKY operation:

VERB 33 ENTR

TARGET #4 AZ AND ELEV

15. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +13500
Row 2 displays +00000

If display is correct proceed to step 17, if not, proceed to step 16.

16. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24 ENTR
+13500 ENTR
+00000 ENTR

17. Perform the following DSKY operations:

VERB 33 ENTR

MARK ON TARGET #1

18. Set the OPTICS MODE switch on the Indicator Control panel to MAN and the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 180.0° and 32.5° respectively.

19. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If MARK was satisfactory, proceed to the next step, if not press MARK REJECT and repeat this step.

MARK ON TARGET #4

20. Set the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

21. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton. If MARK was satisfactory, press ENTR and proceed to the next step, if not, press MARK REJECT and repeat this step.

X, Y, Z GYRO ERRORS

22. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

23. Perform the following DSKY operations:

VERB 34 ENTR

Observe the PROG lamp changes to 02. Set the OPTICS MODE switch to ZERO.

24. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

25. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 25.8 (+0.25, -0 vdc). Record the indication.

26. Repeat step 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 31.8 (+0, -0.25 vdc). Record the indication.

28. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

---

29. Perform the following DSKY operations:

VERB 36 ENTR

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc.

31. Perform the calculations on the calculation sheet and complete the data sheets.

32. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development
DIV #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

Table 1

Latitude of Test Site

Location	Latitude λ	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
MILA	28.516	.82868
NAA	33.921	.82985

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8

JDC
NO. 12222
REV. B
INITIAL TDRR 29882

JOB GYRO COMPASSING

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ___

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2	IMU OPERATE BUS, 28VDC	volts dc	28.3		29.3			a
22	X Gyro elevation error Row 1 (+2 HRS)	degrees	-.03	( ) __.___	+.03			b
	Y Gyro elevation error Row 2 (+2 HRS)	degrees	-.03	( ) __.___	+.03			c
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			d
24 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			e
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			f

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 8

JDC
NO. 12222
REV. B

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			g
24 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			h
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			i
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			j
24 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			k
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			l
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			m
24 (60 min)	X Gyro elevation error Row 2 (+3 HRS)	degrees	▨	( ) __.___	▨			n

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 8

JDC
NO. 12222
REV. B

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2 (+3 HRS)	degrees	▨	( ) __.___	▨			o
	Z Gyro azimuth error Row 3 (+3 HRS)	degrees	▨	( ) __.___	▨			p
25	IMU OPERATE BUS 28 VDC	volts dc	25.8		26.05			q
26 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			r
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			s
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			t
26 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			u
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			v
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			w

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 8

JDC
NO. 12222
REV. B

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
26 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			x
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			y
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			z
26 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			aa
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ab
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ac
27	IMU OPERATE BUS 28 VDC	volts dc	31.55		31.8			ad
28 (15 min)	X Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ae

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12222
REV. B

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.____	▨			af
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.____	▨			ag
28 (30 min)	X Gyro elevation error Row 2	degrees	▨	( ) ___.____	▨			ah
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.____	▨			ai
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.____	▨			aj
28 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.____	▨			ak
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.____	▨			al
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.____	▨			am

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
NO. 12222
REV. B

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.____	▨			an
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.____	▨			ao
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.____	▨			ap
31	Azimuth error contributed by IRIG coefficients	degrees	▨		▨			aq
31a	Z Gyro azimuth error (corrected) +2 HRS	degrees	-.57		+.57			ar
31b	ΔX Gyro elevation error +3 HRS	degrees	-.02		+.02			as
31c	ΔY Gyro elevation error +3 HRS	degrees	-.02		+.02			at
31d	ΔZ Gyro azimuth error +3 HRS	degrees	-.06		+.06			au
31e	ΔX Gyro elevation error +4 HRS (LO BUS)	degrees	-.02		+.02			av

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 8

JDC
NO. 12222
REV. B

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
31f	ΔY Gyro elevation error +4 HRS (LO BUS)	degrees	-.02		+.02			aw
31g	ΔZ Gyro azimuth error +4 HRS (LO BUS)	degrees	-.06		+.06			ax
31h	ΔX Gyro elevation error +5 HRS (HI BUS)		▨		▨			ay
31i	ΔY Gyro elevation error +5 HRS (HI BUS)		▨		▨			az
31j	ΔZ Gyro azimuth error +5 HRS (HI BUS)		▨		▨			ba

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 8

JDC
NO. 12222
REV. B

JOB GYRO COMPASSING

CALCULATIONS SHEET

Record the latest values of the following coefficients from JDC 12217.

NBDX ( ) ____________
NBDY ( ) ____________
NBDZ ( ) ____________
ADIAZ ( ) ____________
ADSRAY ( ) ____________

Perform the following calculations. Cos λ functions are provided in table 1.

Drift (vert) = NDBZ + ADIAZ
Drift (vert) = ( ) ____________ meru

Drift (east) = .707(NBDY + NBDX + ADSRAY)
Drift (east) = ( ) ____________ meru

IRIG COEFFICIENT AZ ERROR CONTRIBUTION

$$\phi\text{(vert)} = \frac{\text{D(vert)} \times \frac{24.2}{\text{Cos } \lambda} + \text{D(east)} \times \frac{206}{\text{Cos } \lambda}}{3600}$$

ø (vert) = ( ) ____________ degrees

Record answer on line aq.

Perform the following calculations

a.	line d - line aq	record on line ar
b.	line b - line n	record on line as
c.	line c - line o	record on line at
d.	line d - line p	record on line au
e.	line b - line aa	record on line av
f.	line c - line ab	record on line aw
g.	line d - line ac	record on line ax
h.	line b - line an	record on line ay
i.	line c - line ao	record on line az
j.	line d - line ap	record on line ba

DATE 30 JUN 66

JDC 12222 REV. C PAGE 1 OF 4

JOB GYRO COMPASSING

INITIAL TDRR 29882 D.S. PGS. 8

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30311	2,4	1-6	EA	WS
B	9-1-66	30926	2,4	-	JP	-
C	11-10-66	31900	2,4	-	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the Gyro Compassing capabilities of the G & N System. The test is is computer controlled. The system is erected with the X Gyro Northeast, the Y Gyro Southeast, and the Z Gyro down. The output of the X and Y PIPA's is used to hold the platform vertical. The Y PIPA and X Gyro comprise the compassing loop. The X and Y gyro elevation errors and the Z gyro azimuth error are checked after a two hour settling period and every 15 minutes thereafter for a period of 3 hours, using optical verification. The test takes approximately 5 hours to perform. From the third to the fourth hour, the prime power is set to the LO limit. From the fourth to the fifth hour the prime power is set to the HI limit.

INITIALIZATION

1. Establish a Master Initialization Condition.

VOLTAGE SETTING (NOMINAL)

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc. Record the indication.

TEST ENTRY

3. Perform the following DSKY operations:

VERB 57 ENTR
00006 ENTR

Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of the DSKY displays +04500. If the display is correct proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations. To change only Row 1:

VERB 21 ENTR
+04500 ENTR

6. Perform the following DSKY operation:

VERB 33 ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +XX.XXX (Test site latitude from Table 1)

If the display is correct proceed to step 9, if not proceed to step 8.

8. Perform the following DSKY operations. To change only Row 1:

VERB 21 ENTR
+18000 ENTR

To change only Row 2

VERB 22 ENTR
+XX.XXX (Test site latitude from Table 1) ENTR

9. Perform the following DSKY operations:

VERB 33 ENTR

Observe the PROG lamp remains at 01 for approximately 90 seconds then to 05 for approximately 15 minutes, then to 02 for the duration of this test.

TEST RESULTS AT 2 HRS

10. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. After 120 minutes have elapsed since initiation of step 9, set the OPTICS MODE switch on the Indicator Control panel to ZERO.

11. Perform the following DSKY operations:

Enter VERB 52 ENTR

Observe the PROG lamp changes to 03.

TARGET #1 AZ AND ELEV

12. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +00000

If the display is correct proceed to step 14, if not, proceed to step 13.

13. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24 ENTR
+18000 ENTR
+00000 ENTR

14. Perform the following DSKY operation:

VERB 33 ENTR

TARGET #4 AZ AND ELEV

15. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +13500
Row 2 displays +00000

If display is correct proceed to step 17, if not, proceed to step 16.

16. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24 ENTR
+13500 ENTR
+00000 ENTR

17. Perform the following DSKY operations:

VERB 33 ENTR

MARK ON TARGET #1

18. Set the OPTICS MODE switch on the Indicator Control panel to MAN and the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 180.0° and 32.5° respectively.

19. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If MARK was satisfactory, proceed to the next step, if not press MARK REJECT and repeat this step.

MARK ON TARGET #4

20. Set the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

21. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton. If MARK was satisfactory, press ENTR and proceed to the next step, if not, press MARK REJECT and repeat this step.

X, Y, Z GYRO ERRORS

22. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

23. Perform the following DSKY operations:

VERB 34 ENTR

Observe the PROG lamp changes to 02. Set the OPTICS MODE switch to ZERO.

24. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

25. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 25.8 (+0.25, -0 vdc). Record the indication.

---

26. Repeat step 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 31.8 (+0, -0.25 vdc). Record the indication.

28. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

29. Perform the following DSKY operations:

VERB 36 ENTR

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

31. Perform the calculations on the calculation sheet and complete the data sheets.

32. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development
DIV #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

Table 1

Latitude of Test Site

Location	Latitude λ	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
MILA	28.516	.82868
NAA	33.921	.82985

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8

JDC
NO. 12222
REV. C
INITIAL TDRR 29882

JOB GYRO COMPASSING

ASSEMBLY UNDER TEST

TITLE ____________________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________________ SER. NO. ________ CAL DATE

NAME ____________________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2	IMU OPERATE BUS, 28VDC	volts dc	28.3		29.3			a
22	X Gyro elevation error Row 1 (+ 2 HRS)	degrees	-.03	( ) __.___	+.03			b
	Y Gyro elevation error Row 2 (+ 2 HRS)	degrees	-.03	( ) __.___	+.03			c
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			d
24 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			e
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			f

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 8

JDC
NO. 12222
REV. C

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			g
24 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			h
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			i
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			j
24 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			k
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			l
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			m
24 (60 min)	X Gyro elevation error Row 2 (+ 3 HRS)	degrees	▨	( ) __.___	▨			n

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 8

JDC
NO. 12222
REV. C

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2 (+ 3 HRS)	degrees	▨	( ) __.___	▨			o
	Z Gyro azimuth error Row 3 (+ 3 HRS)	degrees	▨	( ) __.___	▨			p
25	IMU OPERATE BUS 28 VDC	volts dc	25.8		26.05			q
26 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			r
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			s
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			t
26 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			u
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			v
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			w

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 8

JDC
NO. 12222
REV. C

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
26 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			x
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			y
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			z
26 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			aa
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ab
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ac
27	IMU OPERATE BUS 28 VDC	volts dc	31.55		31.8			ad
28 (15 min)	X Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ae

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12222
REV. C

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			af
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			ag
28 (30 min)	X Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			ah
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			ai
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			aj
28 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			ak
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			al
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			am

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
NO. 12222
REV. C

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			an
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			ao
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			ap
31	Azimuth error contributed by IRIG coefficients	degrees	▨		▨			aq
31a	Z Gyro azimuth error (corrected) +2 HRS	degrees	-.57		+.57			ar
31b	ΔX Gyro elevation error +3 HRS	degrees	-.02		+.02			as
31c	ΔY Gyro elevation error +3 HRS	degrees	-.02		+.02			at
31d	ΔZ Gyro azimuth error +3 HRS	degrees	-.06		+.06			au
31e	ΔX Gyro elevation error +4 HRS (LO BUS)	degrees	-.02		+.02			av

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 8

JDC
NO. 12222
REV. C

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
31f	ΔY Gyro elevation error +4 HRS (LO BUS)	degrees	-.02		+.02			aw
31g	ΔZ Gyro azimuth error +4 HRS (LO BUS)	degrees	-.06		+.06			ax
31h	ΔX Gyro elevation error +5 HRS (HI BUS)		▨		▨			ay
31i	ΔY Gyro elevation error +5 HRS (HI BUS)		▨		▨			az
31j	ΔZ Gyro azimuth error +5 HRS (HI BUS)		▨		▨			ba

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 8

JDC
NO. 12222
REV. C

JOB GYRO COMPASSING

CALCULATIONS SHEET

Record the latest values of the following coefficients from JDC 12217.

NBDX ( ) ____________
NBDY ( ) ____________
NBDZ ( ) ____________
ADIAZ ( ) ____________
ADSRAY ( ) ____________

Perform the following calculations. Cos λ functions are provided in table 1.

Drift (vert) = NDBZ + ADIAZ
Drift (vert) = ( ) ____________ meru

Drift (east) = .707(NBDY + NBDX + ADSRAY)
Drift (east) = ( ) ____________ meru

IRIG COEFFICIENT AZ ERROR CONTRIBUTION

$$\text{ø(vert)} = \frac{\text{D(vert)} \times \frac{24.2}{\text{Cos } \lambda} + \text{D(east)} \times \frac{206}{\text{Cos } \lambda}}{3600}$$

ø(vert) = ( ) ____________ degrees

Record answer on line aq.

Perform the following calculations

a.	line d - line aq	record on line ar
b.	line b - line n	record on line as
c.	line c - line o	record on line at
d.	line d - line p	record on line au
e.	line b - line aa	record on line av
f.	line c - line ab	record on line aw
g.	line d - line ac	record on line ax
h.	line b - line an	record on line ay
i.	line c - line ao	record on line az
j.	line d - line ap	record on line ba

DATE 30 JUN 66

JOB GYRO COMPASSING

JDC 12222 REV. D PAGE 1 OF 4

INITIAL TDRR 29882 D.S. PGS 8

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30311	2,4	1-6	EA	WS
B	9-1-66	30926	2,4	-	JP	-
C	11-10-66	31900	2,4	-	EA	-
D	11-15-66	31949	-	6,7	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the Gyro Compassing capabilities of the G & N System. The test is is computer controlled. The system is erected with the X Gyro Northeast, the Y Gyro Southeast, and the Z Gyro down. The output of the X and Y PIPA's is used to hold the platform vertical. The Y PIPA and X Gyro comprise the compassing loop. The X and Y gyro elevation errors and the Z gyro azimuth error are checked after a two hour settling period and every 15 minutes thereafter for a period of 3 hours, using optical verification. The test takes approximately 5 hours to perform. From the third to the fourth hour, the prime power is set to the LO limit. From the fourth to the fifth hour the prime power is set to the HI limit.

INITIALIZATION

1. Establish a Master Initialization Condition.

VOLTAGE SETTING (NOMINAL)

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±Q5) vdc. Record the indication.

TEST ENTRY

3. Perform the following DSKY operations:

VERB 57	ENTR
00006	ENTR

Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of the DSKY displays +04500. If the display is correct proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations. To change only Row 1:

VERB 21	ENTR
+04500	ENTR

6. Perform the following DSKY operation:

VERB 33	ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays	+18000
Row 2 displays	+XX.XXX (Test site latitude from Table 1)

If the display is correct proceed to step 9, if not proceed to step 8.

8. Perform the following DSKY operations. To change only Row 1:

VERB 21	ENTR
+18000	ENTR

To change only Row 2

VERB 22	ENTR
+XX.XXX (Test site latitude from Table 1)	ENTR

9. Perform the following DSKY operations:

VERB 33	ENTR

Observe the PROG lamp remains at 01 for approximately 90 seconds then to 05 for approximately 15 minutes, then to 02 for the duration of this test.

TEST RESULTS AT 2 HRS

10. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. After 120 minutes have elapsed since initiation of step 9, set the OPTICS MODE switch on the Indicator Control panel to ZERO.

11. Perform the following DSKY operations:

Enter VERB 52	ENTR

Observe the PROG lamp changes to 03.

TARGET #1 AZ AND ELEV

12. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000

Row 2 displays +00000

If the display is correct proceed to step 14, if not, proceed to step 13.

13. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24	ENTR
+18000	ENTR
+00000	ENTR

14. Perform the following DSKY operation:

VERB 33	ENTR

TARGET #4 AZ AND ELEV

15. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +13500

Row 2 displays +00000

If display is correct proceed to step 17, if not, proceed to step 16.

16. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24	ENTR
+13500	ENTR
+00000	ENTR

17. Perform the following DSKY operations:

VERB 33	ENTR

MARK ON TARGET #1

18. Set the OPTICS MODE switch on the Indicator Control panel to MAN and the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 180.0° and 32.5° respectively.

19. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If MARK was satisfactory, proceed to the next step, if not press MARK REJECT and repeat this step.

MARK ON TARGET #4

20. Set the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

21. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton. If MARK was satisfactory, press ENTR and proceed to the next step, if not, press MARK REJECT and repeat this step.

X, Y, Z GYRO ERRORS

22. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

23. Perform the following DSKY operations:

VERB 34	ENTR

Observe the PROG lamp changes to 02. Set the OPTICS MODE switch to ZERO.

24. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

25. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 25.8 (+0.25, -0 vdc). Record the indication.

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26. Repeat step 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 31.8 (+0, -0.25 vdc). Record the indication.

28. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

29. Perform the following DSKY operations:

VERB 36	ENTR

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

31. Perform the calculations on the calculation sheet and complete the data sheets.

32. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development
DIV #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

Table 1

Latitude of Test Site

Location	Latitude λ	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
MILA	28.516	.82868
NAA	33.921	.82985

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 8

JOB GYRO COMPASSING

JDC
NO. 12222
REV. D
INITIAL TDRR 29882

ASSEMBLY UNDER TEST	**TEST HISTORY**
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______

NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2	IMU OPERATE BUS, 28VDC	volts dc	28.3		29.3			a
22	X Gyro elevation error Row 1 (+ 2 HRS)	degrees	-.03	( ) __.___	+.03			b
	Y Gyro elevation error Row 2 (+ 2 HRS)	degrees	-.03	( ) __.___	+.03			c
	Z Gyro azimuth error Row 3	degrees		( ) __.___				d
24 (15 min)	X Gyro elevation error Row 1	degrees		( ) __.___				e
	Y Gyro elevation error Row 2	degrees		( ) __.___				f

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EQUIPMENT TEST
DATA SHEET 2 **OF** 8

JOB GYRO COMPASSING

JDC
NO. 12222
REV. D

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Z Gyro azimuth error Row 3	degrees		( ) __.___				g
24 (30 min)	X Gyro elevation error Row 1	degrees		( ) __.___				h
	Y Gyro elevation error Row 2	degrees		( ) __.___				i
	Z Gyro azimuth error Row 3	degrees		( ) __.___				j
24 (45 min)	X Gyro elevation error Row 1	degrees		( ) __.___				k
	Y Gyro elevation error Row 2	degrees		( ) __.___				l
	Z Gyro azimuth error Row 3	degrees		( ) __.___				m
24 (60 min)	X Gyro elevation error Row 2 (+ 3 HRS)	degrees		( ) __.___				n

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JOB GYRO COMPASSING

JDC
NO. 12222
REV. D

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2 (+ 3 HRS)	degrees		( ) __.___				o
	Z Gyro azimuth error Row 3 (+ 3 HRS)	degrees		( ) __.___				p
25	IMU OPERATE BUS 28 VDC	volts dc	25.8		26.05			q
26 (15 min)	X Gyro elevation error Row 1	degrees		( ) __.___				r
	Y Gyro elevation error Row 2	degrees		( ) __.___				s
	Z Gyro azimuth error Row 3	degrees		( ) __.___				t
26 (30 min)	X Gyro elevation error Row 1	degrees		( ) __.___				u
	Y Gyro elevation error Row 2	degrees		( ) __.___				v
	Z Gyro azimuth error Row 3	degrees		( ) __.___				w

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 8

JOB GYRO COMPASSING

JDC
NO. 12222
REV. D

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
26 (45 min)	X Gyro elevation error Row 1	degrees		( ) __.___				x
	Y Gyro elevation error Row 2	degrees		( ) __.___				y
	Z Gyro azimuth error Row 3	degrees		( ) __.___				z
26 (60 min)	X Gyro elevation error Row 1	degrees		( ) __.___				aa
	Y Gyro elevation error Row 2	degrees		( ) __.___				ab
	Z Gyro azimuth error Row 3	degrees		( ) __.___				ac
27	IMU OPERATE BUS 28 VDC	volts dc	31.55		31.8			ad
28 (15 min)	X Gyro elevation error Row 2	degrees		( ) __.___				ae

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EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12222
REV. D

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.____	▨			af
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.____	▨			ag
28 (30 min)	X Gyro elevation error Row 2	degrees	▨	( ) ___.____	▨			ah
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.____	▨			ai
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.____	▨			aj
28 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.____	▨			ak
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.____	▨			al
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.____	▨			am

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EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
NO. 12222
REV. D

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.____	▨			an
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.____	▨			ao
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.____	▨			ap
31	Azimuth error contributed by IRIG coefficients	degrees	▨		▨			aq
31a	Z Gyro azimuth error (corrected) +2 HRS	degrees	-.57		+.57			ar
31b	ΔX Gyro elevation error +3 HRS	degrees	-.03		+.03			as
31c	ΔY Gyro elevation error +3 HRS	degrees	-.03		+.03			at
31d	ΔZ Gyro azimuth error +3 HRS	degrees	-.06		+.06			au
31e	ΔX Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			av

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DATA SHEET 7 OF 8

JDC
NO. 12222
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JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
31f	ΔY Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			aw
31g	ΔZ Gyro azimuth error +4 HRS (LO BUS)	degrees	▨		▨			ax
31h	ΔX Gyro elevation error +5 HRS (HI BUS)		▨		▨			ay
31i	ΔY Gyro elevation error +5 HRS (HI BUS)		▨		▨			az
31j	ΔZ Gyro azimuth error +5 HRS (HI BUS)		▨		▨			ba

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 8

JDC
NO. 12222
REV. D

JOB GYRO COMPASSING

CALCULATIONS SHEET

Record the latest values of the following coefficients from JDC 12217.

NBDX ( ) ____________
NBDY ( ) ____________
NBDZ ( ) ____________
ADIAZ ( ) ____________
ADSRAY ( ) ____________

Perform the following calculations. Cos λ functions are provided in table 1.

Drift (vert) = NBDZ + ADIAZ
Drift (vert) = ( ) ____________ meru
Drift (east) = .707(NBDY + NBDX + ADSRAY)
Drift (east) = ( ) ____________ meru

IRIG COEFFICIENT AZ ERROR CONTRIBUTION

$$\phi\,(\text{vert}) = \frac{D(\text{vert}) \times \frac{24.2}{\cos\lambda} + D(\text{east}) \times \frac{206}{\cos\lambda}}{3600}$$

ϕ (vert) = ( ) ____________ degrees
Record answer on line aq.

Perform the following calculations

a.	line d - line aq	record on line ar
b.	line b - line n	record on line as
c.	line c - line o	record on line at
d.	line d - line p	record on line au
e.	line b - line aa	record on line av
f.	line c - line ab	record on line aw
g.	line d - line ac	record on line ax
h.	line b - line an	record on line ay
i.	line c - line ao	record on line az
j.	line d - line ap	record on line ba

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SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	7-28-66	30311	2,4	1-6	EA	WS	
B	9-1-66	30926	2,4	-	JP	-	
C	11-10-66	31900	2,4	-	EA	-	IMPORTANT
D	11-15-66	31949	-	6,7	EA	-	
E	11-15-66	31953	-	1	EA	-	
							INTERVAL
							TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the Gyro Compassing capabilities of the G & N System. The test is is computer controlled. The system is erected with the X Gyro Northeast, the Y Gyro Southeast, and the Z Gyro down. The output of the X and Y PIPA's is used to hold the platform vertical. The Y PIPA and X Gyro comprise the compassing loop. The X and Y gyro elevation errors and the Z gyro azimuth error are checked after a two hour settling period and every 15 minutes thereafter for a period of 3 hours, using optical verification. The test takes approximately 5 hours to perform. From the third to the fourth hour, the prime power is set to the LO limit. From the fourth to the fifth hour the prime power is set to the HI limit.

INITIALIZATION

1. Establish a Master Initialization Condition.

VOLTAGE SETTING (NOMINAL)

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±05) vdc. Record the indication.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

TEST ENTRY

3. Perform the following DSKY operations:

VERB 57 ENTR
00006 ENTR

Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of the DSKY displays +04500. If the display is correct proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations To change only Row 1:

VERB 21 ENTR
+04500 ENTR

6. Perform the following DSKY operation:

VERB 33 ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +XX.XXX (Test site latitude from Table 1)

If the display is correct proceed to step 9, if not proceed to step 8.

8. Perform the following DSKY operations To change only Row 1:

VERB 21 ENTR
+18000 ENTR

To change only Row 2

VERB 22 ENTR
+XX.XXX (Test site latitude from Table 1) ENTR

9. Perform the following DSKY operations:

VERB 33 ENTR

Observe the PROG lamp remains at 01 for approximately 90 seconds then to 05 for approximately 15 minutes, then to 02 for the duration of this test.

TEST RESULTS AT 2 HRS

10. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. After 120 minutes have elapsed since initiation of step 9, set the OPTICS MODE switch on the Indicator Control panel to ZERO.

11. Perform the following DSKY operations:

Enter VERB 52 ENTR

Observe the PROG lamp changes to 03.

TARGET #1 AZ AND ELEV

12. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +00000

If the display is correct proceed to step 14, if not, proceed to step 13.

13. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24 ENTR
+18000 ENTR
+00000 ENTR

14. Perform the following DSKY operation:

VERB 33 ENTR

TARGET #4 AZ AND ELEV

15. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +13500
Row 2 displays +00000

If display is correct proceed to step 17, if not, proceed to step 16.

16. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24 ENTR
+13500 ENTR
+00000 ENTR

17. Perform the following DSKY operations:

VERB 33 ENTR

MARK ON TARGET #1

18. Set the OPTICS MODE switch on the Indicator Control panel to MAN and the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 180.0° and 32.5° respectively.

19. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If MARK was satisfactory, proceed to the next step, if not press MARK REJECT and repeat this step.

MARK ON TARGET #4

20. Set the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

21. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton. If MARK was satisfactory, press ENTR and proceed to the next step, if not, press MARK REJECT and repeat this step.

X, Y, Z GYRO ERRORS

22. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

23. Perform the following DSKY operations:

VERB 34 ENTR

Observe the PROG lamp changes to 02. Set the OPTICS MODE switch to ZERO.

24. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

25. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 25.8 (+0.25, -0 vdc). Record the indication.

26. Repeat step 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 31.8 (+0, -0.25 vdc). Record the indication.

28. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

29. Perform the following DSKY operations:

VERB 36 ENTR

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

31. Perform the calculations on the calculation sheet and complete the data sheets.

32. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development
DIV #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

Table 1

Latitude of Test Site

Location	Latitude λ	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
MILA	28.516	.82868
NAA	33.921	.82985

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DATA SHEET 1 OF 8
JOB GYRO COMPASSING

JDC
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REV. E
INITIAL TDRR 29882

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2	IMU OPERATE BUS, 28VDC	volts dc	28.3		29.3			a
22	X Gyro elevation error Row 1 (+2 HRS)	degrees	-.06	( ) __.___	+.06			b
	Y Gyro elevation error Row 2 (+2 HRS)	degrees	-.06	( ) __.___	+.06			c
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			d
24 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			e
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			f

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. E

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			g
24 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			h
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			i
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			j
24 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			k
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			l
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			m
24 (60 min)	X Gyro elevation error Row 2 (+3 HRS)	degrees	▨	( ) __.___	▨			n

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EQUIPMENT TEST
DATA SHEET 3 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. E

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2 (+3 HRS)	degrees	▨	( ) __.___	▨			o
	Z Gyro azimuth error Row 3 (+3 HRS)	degrees	▨	( ) __.___	▨			p
25	IMU OPERATE BUS 28 VDC	volts dc	25.8		26.05			q
26 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			r
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			s
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			t
26 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			u
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			v
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			w

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EQUIPMENT TEST
DATA SHEET 4 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. E

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
26 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			x
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			y
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			z
26 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			aa
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ab
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ac
27	IMU OPERATE BUS 28 VDC	volts dc	31.55		31.8			ad
28 (15 min)	X Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ae

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12222
REV. E

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			af
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ag
28 (30 min)	X Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ah
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ai
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			aj
28 (45 min	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			ak
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			al
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			am

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
NO. 12222
REV. E

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			an
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ao
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ap
31	Azimuth error contributed by IRIG coefficients	degrees	▨		▨			aq
31a	Z Gyro azimuth error (corrected) +2 HRS	degrees	-.57		+.57			ar
31b	ΔX Gyro elevation error +3 HRS	degrees	-.03		+.03			as
31c	ΔY Gyro elevation error +3 HRS	degrees	-.03		+.03			at
31d	ΔZ Gyro azimuth error +3 HRS	degrees	-.06		+.06			au
31e	ΔX Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			av

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 8

JDC
NO. 12222
REV. E

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
31f	ΔY Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			aw
31g	ΔZ Gyro azimuth error +4 HRS (LO BUS)	degrees	▨		▨			ax
31h	ΔX Gyro elevation error +5 HRS (HI BUS)		▨		▨			ay
31i	ΔY Gyro elevation error +5 HRS (HI BUS)		▨		▨			az
31j	ΔZ Gyro azimuth error +5 HRS (HI BUS)		▨		▨			ba

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 8

JDC
NO. 12222
REV. E

JOB GYRO COMPASSING

CALCULATIONS SHEET

Record the latest values of the following coefficients from JDC 12217.

NBDX ( ) ______________
NBDY ( ) ______________
NBDZ ( ) ______________
ADIAZ ( ) ______________
ADSRAY ( ) ______________

Perform the following calculations. Cos λ functions are provided in table 1.

Drift (vert) = NDBZ + ADIAZ
Drift (vert) = ( ) ______________ meru

Drift (east) = .707(NBDY + NBDX + ADSRAY)
Drift (east) = ( ) ______________ meru

IRIG COEFFICIENT AZ ERROR CONTRIBUTION

$$\phi\,(\text{vert}) = \frac{D(\text{vert}) \times \frac{24.2}{\text{Cos}\ \lambda} + D(\text{east}) \times \frac{206}{\text{Cos}\ \lambda}}{3600}$$

ϕ (vert) = ( ) ______________ degrees

Record answer on line aq.

Perform the following calculations

a.	line d - line aq	record on line ar
b.	line b - line n	record on line as
c.	line c - line o	record on line at
d.	line d - line p	record on line au
e.	line b - line aa	record on line av
f.	line c - line ab	record on line aw
g.	line d - line ac	record on line ax
h.	line b - line an	record on line ay
i.	line c - line ao	record on line az
j.	line d - line ap	record on line ba

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JOB GYRO COMPASSING
JDC 12222 REV. F PAGE 1 OF 4
INITIAL TDRR 29882 D.S. PGS 8

SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30311	2,4	1-6	EA	WS
B	9-1-66	30926	2,4	-	JP	-
C	11-10-66	31900	2,4	-	EA	-
D	11-15-66	31949	-	6,7	EA	-
E	11-15-66	31953	-	1	EA	-
F	12-28-66	32479	All	2,4,5,8	JP	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the Gyro Compassing capabilities of the G & N System. The test is is computer controlled. The system is erected with the X Gyro Northeast, the Y Gyro Southeast, and the Z Gyro down. The output of the X and Y PIPA's is used to hold the platform vertical. The Y PIPA and X Gyro comprise the compassing loop. The X and Y gyro elevation errors and the Z gyro azimuth error are checked after a two hour settling period and every 15 minutes thereafter for a period of 3 hours, using optical verification. The test takes approximately 5 hours to perform. From the third to the fourth hour, the prime power is set to the LO limit. From the fourth to the fifth hour the prime power is set to the HI limit.

INITIALIZATION

1. Establish a Master Initialization Condition (JDC 12215). Insure that G&N Mounting Fixture is tilted to 32.5°.

VOLTAGE SETTING (NOMINAL)

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB GYRO COMPASSING
JDC 12222 REV F PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM
ASSY

the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±05) vdc. Record the indication.

TEST ENTRY

3. Perform the following DSKY operations:

VERB 57	ENTR
00006	ENTR

Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of the DSKY displays +04500. If the display is correct proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations To change only Row 1:

VERB 21	ENTR
+04500	ENTR

6. Perform the following DSKY operation:

VERB 33	ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays	+18000
Row 2 displays	+XX.XXX (Test site latitude from Table 1)

If the display is correct proceed to step 9, if not proceed to step 8.

8. Perform the following DSKY operations To change only Row 1:

VERB 21	ENTR
+18000	ENTR

To change only Row 2

VERB 22	ENTR
+XX.XXX (Test site latitude from Table 1)	ENTR

9. Perform the following DSKY operations:

VERB 33	ENTR

Observe the PROG lamp changes from 01 after approximately 90 seconds to 05 for approximately 5 minutes, then to 02 for the remainder of the test.

TEST RESULTS AT 2 HRS

10. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. After 120 minutes have elapsed since initiation of step 9, set the OPTICS MODE switch on the Indicator Control panel to ZERO.

11. Perform the following DSKY operations:

VERB 52	ENTR

Observe the PROG lamp changes to 03.

TARGET #1 AZ AND ELEV

12. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +00000

If the display is correct proceed to step 14, if not, proceed to step 13.

13. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24	ENTR
+18000	ENTR
+00000	ENTR

14. Perform the following DSKY operation:

VERB 33	ENTR

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JOB GYRO COMPASSING
JDC 12222 REV F PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM
ASSY

TARGET #4 AZ AND ELEV

15. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +13500
Row 2 displays +00000

If display is correct proceed to step 17, if not, proceed to step 16.

16. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24	ENTR
+13500	ENTR
+00000	ENTR

17. Perform the following DSKY operations:

VERB 33	ENTR

MARK ON TARGET #1

18. Set the OPTICS MODE switch on the Indicator Control panel to MAN and the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 180.0° and 32.5° respectively.

19. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT reticle pattern is centered on the target #1 pattern. Press the MARK pushbutton. If MARK was satisfactory, proceed to the next step, if not press MARK REJECT and repeat this step.

MARK ON TARGET #4

20. Set the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

21. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT reticle pattern is centered on the target #4 pattern. Press the MARK pushbutton. If MARK was satisfactory, press ENTR and proceed to next step, if not, press MARK REJECT and repeat this step.

X, Y, Z GYRO ERRORS

22. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

23. Perform the following DSKY operations:

VERB 34	ENTR

Observe the PROG lamp changes to 02. Set the OPTICS MODE switch to ZERO.

24. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

25. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 25.8 (+0.25, -0 vdc). Record the indication.

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Chg. 7-23-65

JOB GYRO COMPASSING
JDC 12222 REV F PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM
ASSY

26. Repeat step 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 31.8 (+0, -0.25 vdc). Record the indication.

28. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

29. Perform the following DSKY operations:

VERB 36	ENTR

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

31. Perform the calculations on the calculation sheet and complete the data sheets.

32. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development
DIV #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

Table 1

Latitude of Test Site

Location	Latitude λ	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
KSC	28.516	.87868
NAA	33.921	.82985

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JOB GYRO COMPASSING	JDC 12222 REV. F PAGE 1 OF 4 INITIAL TDRR 29882 D.S. P3S 8
SUBSYSTEM G & N SYSTEM	ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30311	2,4	1-6	EA	WS
B	9-1-66	30926	2,4	-	JP	—
C	11-10-66	31900	2,4	-	EA	-
D	11-15-66	31949	-	6,7	EA	-
E	11-15-66	31953	-	1	EA	-
F	12-28-66	32479	All	2,4,5,8	JP	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the Gyro Compassing capabilities of the G & N System. The test is is computer controlled. The system is erected with the X Gyro Northeast, the Y Gyro Southeast, and the Z Gyro down. The output of the X and Y PIPA's is used to hold the platform vertical. The Y PIPA and X Gyro comprise the compassing loop. The X and Y gyro elevation errors and the Z gyro azimuth error are checked after a two hour settling period and every 15 minutes thereafter for a period of 3 hours, using optical verification. The test takes approximately 5 hours to perform. From the third to the fourth hour, the prime power is set to the LO limit. From the fourth to the fifth hour the prime power is set to the HI limit.

INITIALIZATION

1. Establish a Master Initialization Condition (JDC 12215). Insure that G&N Mounting Fixture is tilted to 32.5°.

VOLTAGE SETTING (NOMINAL)

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±05) vdc. Record the indication.

TEST ENTRY

3. Perform the following DSKY operations:

VERB 57	ENTR
00006	ENTR

Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of the DSKY displays +04500. If the display is correct proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations To change only Row 1:

VERB 21	ENTR
+04500	ENTR

6. Perform the following DSKY operation:

VERB 33	ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays	+18000
Row 2 displays	+XX.XXX (Test site latitude from Table 1)

If the display is correct proceed to step 9, if not proceed to step 8.

8. Perform the following DSKY operations To change only Row 1:

VERB 21	ENTR
+18000	ENTR

To change only Row 2

VERB 22	ENTR
+XX.XXX (Test site latitude from Table 1)	ENTR

9. Perform the following DSKY operations:

VERB 33	ENTR

Observe the PROG lamp changes from 01 after approximately 90 seconds to 05 for approximately 5 minutes, then to 02 for the remainder of the test.

TEST RESULTS AT 2 HRS

10. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. After 120 minutes have elapsed since initiation of step 9, set the OPTICS MODE switch on the Indicator Control panel to ZERO.

11. Perform the following DSKY operations:

VERB 52	ENTR

Observe the PROG lamp changes to 03.

TARGET #1 AZ AND ELEV

12. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +00000

If the display is correct proceed to step 14, if not, proceed to step 13.

13. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24	ENTR
+18000	ENTR
+00000	ENTR

14. Perform the following DSKY operation:

VERB 33	ENTR

TARGET #4 AZ AND ELEV

15. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +13500
Row 2 displays +00000

If display is correct proceed to step 17, if not, proceed to step 16.

16. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24	ENTR
+13500	ENTR
+00000	ENTR

17. Perform the following DSKY operations:

VERB 33	ENTR

MARK ON TARGET #1

18. Set the OPTICS MODE switch on the Indicator Control panel to MAN and the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 180.0° and 32.5° respectively.

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MARK ON TARGET #4

20. Set the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

21. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT reticle pattern is centered on the target #4 pattern. Press the MARK pushbutton. If MARK was satisfactory, press ENTR and proceed to next step, if not, press MARK REJECT and repeat this step.

X, Y, Z GYRO ERRORS

22. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

23. Perform the following DSKY operations:

VERB 34	ENTR

Observe the PROG lamp changes to 02. Set the OPTICS MODE switch to ZERO.

24. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

25. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 25.8 (+0.25, -0 vdc). Record the indication.

---

26. Repeat step 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 31.8 (+0, -0.25 vdc). Record the indication.

28. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

29. Perform the following DSKY operations:

VERB 36	ENTR

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

31. Perform the calculations on the calculation sheet and complete the data sheets.

32. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development
DIV #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

Table 1

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Location	Latitude λ	Cos λ
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GAEC	40.748	.75756
MSC	29.556	.86993
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NAA	33.921	.82985

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. F
INITIAL TDRR 29882

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2	IMU OPERATE BUS, 28VDC	volts dc	28.3		29.3			a
22	X Gyro elevation error Row 1 (+2 HRS)	degrees	-.06	( ) __.___	+.06			b
	Y Gyro elevation error Row 2 (+2 HRS)	degrees	-.06	( ) __.___	+.06			c
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			d
24 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			e
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			f

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			g
24 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			h
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			i
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			j
24 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			k
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			l
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			m
24 (60 min)	X Gyro elevation error Row 1 (+3 HRS)	degrees	▨	( ) __.___	▨			n

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2 (+3 HRS)	degrees	▨	( ) __.___	▨			o
	Z Gyro azimuth error Row 3 (+3 HRS)	degrees	▨	( ) __.___	▨			p
25	IMU OPERATE BUS 28 VDC	volts dc	25.8		26.05			q
26 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			r
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			s
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			t
26 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			u
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			v
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			w

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
26 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			x
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			y
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			z
26 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			aa
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ab
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ac
27	IMU OPERATE BUS 28 VDC	volts dc	31.55		31.8			ad
28 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			ae

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. F
INITIAL TDRR [illegible]9882

ASSEMBLY UNDER TEST

TITLE ______________________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______________________ SER. NO. ________ CAL DATE
NAME ______________________ SER. NO. ________ CAL DATE

CONDUCTED BY ______________ NAME/AFFILIATION APPROVED BY ______________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2	IMU OPERATE BUS, 28VDC	volts dc	28.3		29.3			a
22	X Gyro elevation error Row 1 (+2 HRS)	degrees	-.06	( ) ___.___	+.06			b
	Y Gyro elevation error Row 2 (+2 HRS)	degrees	-.06	( ) ___.___	+.06			c
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			d
24 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			e
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			f

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			g
24 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			h
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			i
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			j
24 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			k
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			l
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			m
24 (60 min)	X Gyro elevation error Row 1 (+3 HRS)	degrees	▨	( ) ___.___	▨			n

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2 (+3 HRS)	degrees	▨	( ) ___.___	▨			o
	Z Gyro azimuth error Row 3 (+3 HRS)	degrees	▨	( ) ___.___	▨			p
25	IMU OPERATE BUS 28 VDC	volts dc	25.8		26.05			q
26 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			r
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			s
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			t
26 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			u
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			v
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			w

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
26 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			x
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			y
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			z
26 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			aa
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			ab
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			ac
27	IMU OPERATE BUS 28 VDC	volts dc	31.55		31.8			ad
28 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			ae

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12222
REV. F

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			af
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ag
28 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			ah
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ai
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			aj
28 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			ak
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			al
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			am

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EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
NO. 12222
REV. F

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			an
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ao
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ap
31	Azimuth error contributed by IRIG coefficients	degrees	▨		▨			aq
31a	Z Gyro azimuth error (corrected) +2 HRS	degrees	-.57		+.57			ar
31b	ΔX Gyro elevation error +3 HRS	degrees	-.03		+.03			as
31c	ΔY Gyro elevation error +3 HRS	degrees	-.03		+.03			at
31d	ΔZ Gyro azimuth error +3 HRS	degrees	-.06		+.06			au
31e	ΔX Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			av

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EQUIPMENT TEST
DATA SHEET 7 OF 8

JDC
NO. 12222
REV. F

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
31f	ΔY Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			aw
31g	ΔZ Gyro azimuth error +4 HRS (LO BUS)	degrees	▨		▨			ax
31h	ΔX Gyro elevation error +5 HRS (HI BUS)		▨		▨			ay
31i	ΔY Gyro elevation error +5 HRS (HI BUS)		▨		▨			az
31j	ΔZ Gyro azimuth error +5 HRS (HI BUS)		▨		▨			ba

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EQUIPMENT TEST
DATA SHEET 8 OF 8

JDC
NO. 12222
REV. F

JOB GYRO COMPASSING

CALCULATIONS SHEET

Record the latest values of the following coefficients from JDC 12217.

NBDX ( ) __________
NBDY ( ) __________
NBDZ ( ) __________
ADIAZ ( ) __________
ADSRAY ( ) __________

Perform the following calculations. Cos λ functions are provided in table 1.

Drift (vert) = NBDZ + ADIAZ
Drift (vert) = ( ) __________ meru
Drift (east) = .707(NBDY + NBDX + ADSRAY)
Drift (east) = ( ) __________ meru

IRIG COEFFICIENT AZ ERROR CONTRIBUTION

$$\phi\,(\text{vert}) = \frac{D(\text{vert}) \times \frac{12.8}{\cos\lambda} + D(\text{east}) \times \frac{206}{\cos\lambda}}{3600}$$

ϕ (vert) = ( ) __________ degrees

Record answer on line aq.

Perform the following calculations

a.	line d - line aq	record on line ar
b.	line b - line n	record on line as
c.	line c - line o	record on line at
d.	line d - line p	record on line au
e.	line b - line aa	record on line av
f.	line c - line ab	record on line aw
g.	line d - line ac	record on line ax
h.	line b - line an	record on line ay
i.	line c - line ao	record on line az
j.	line d - line ap	record on line ba

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 **OF** 8

JDC
NO. 12222
REV. F

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			af
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			ag
28 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			ah
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			ai
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			aj
28 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			ak
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			al
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			am

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 **OF** 8

JDC
NO. 12222
REV. F

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			an
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			ao
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			ap
31	Azimuth error contributed by IRIG coefficients	degrees	▨		▨			aq
31a	Z Gyro azimuth error (corrected) +2 HRS	degrees	-.57		+.57			ar
31b	ΔX Gyro elevation error +3 HRS	degrees	-.03		+.03			as
31c	ΔY Gyro elevation error +3 HRS	degrees	-.03		+.03			at
31d	ΔZ Gyro azimuth error +3 HRS	degrees	-.06		+.06			au
31e	ΔX Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			av

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 8

JDC
NO. 12222
REV. F

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
31f	ΔY Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			aw
31g	ΔZ Gyro azimuth error +4 HRS (LO BUS)	degrees	▨		▨			ax
31h	ΔX Gyro elevation error +5 HRS (HI BUS)		▨		▨			ay
31i	ΔY Gyro elevation error +5 HRS (HI BUS)		▨		▨			az
31j	ΔZ Gyro azimuth error +5 HRS (HI BUS)		▨		▨			ba

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 8

JDC
NO. 12222
REV. F

JOB GYRO COMPASSING

CALCULATIONS SHEET

Record the latest values of the following coefficients from JDC 12217.

NBDX ( ) ______________
NBDY ( ) ______________
NBDZ ( ) ______________
ADIAZ ( ) ______________
ADSRAY ( ) ______________

Perform the following calculations. Cos λ functions are provided in table 1.

Drift (vert) = NBDZ + ADIAZ
Drift (vert) = ( ) ______________ meru

Drift (east) = .707(NBDY + NBDX + ADSRAY)
Drift (east) = ( ) ______________ meru

IRIG COEFFICIENT AZ ERROR CONTRIBUTION

$$\phi(\text{vert}) = \frac{D(\text{vert}) \times \frac{12.8}{\cos\lambda} + D(\text{east}) \times \frac{206}{\cos\lambda}}{3600}$$

ϕ(vert) = ( ) ______________ degrees

Record answer on line aq.

Perform the following calculations

a.	line d - line aq	record on line ar
b.	line b - line n	record on line as
c.	line c - line o	record on line at
d.	line d - line p	record on line au
e.	line b - line aa	record on line av
f.	line c - line ab	record on line aw
g.	line d - line ac	record on line ax
h.	line b - line an	record on line ay
i.	line c - line ao	record on line az
j.	line d - line ap	record on line ba

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JOB GYRO COMPASSING

JDC 12222 REV. G PAGE 1 OF 4

INITIAL TDRR 29882 D.S. PGS 9

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-28-66	30311	2,4	1-6	EA	WS
B	9-1-66	30926	2,4	-	JP	-
C	11-10-66	31900	2,4	-	EA	-
D	11-15-66	31949	-	6,7	EA	-
E	11-15-66	31953	-	1	EA	-
F	12-28-66	32479	All	2,4,5,8	JP	-
G	9-6-67	34560	1	-	EA	-

REFERENCES

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the Gyro Compassing capabilities of the G & N System. The test is is computer controlled. The system is erected with the X Gyro Northeast, the Y Gyro Southeast, and the Z Gyro down. The output of the X and Y PIPA's is used to hold the platform vertical. The Y PIPA and X Gyro comprise the compassing loop. The X and Y gyro elevation errors and the Z gyro azimuth error are checked after a two hour settling period and every 15 minutes thereafter for a period of 3 hours, using optical verification. The test takes approximately 5 hours to perform. From the third to the fourth hour, the prime power is set to the LO limit. From the fourth to the fifth hour the prime power is set to the HI limit.

INITIALIZATION

1. Establish a Master Initialization Condition (JDC 12215). Insure that G&N Mounting Fixture is tilted to 32.5°.

VOLTAGE SETTING (NOMINAL)

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB GYRO COMPASSING

JDC 12222 REV G PAGE 2 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±05) vdc. Record the indication.

TEST ENTRY

3. Perform the following DSKY operations:

VERB 57	ENTR
00006	ENTR

Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of the DSKY displays +04500. If the display is correct proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations To change only Row 1:

VERB 21	ENTR
+04500	ENTR

6. Perform the following DSKY operation:

VERB 33	ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays	+18000
Row 2 displays	+XX.XXX (Test site latitude from Table 1)

If the display is correct proceed to step 9, if not proceed to step 8.

8. Perform the following DSKY operations To change only Row 1:

VERB 21	ENTR
+18000	ENTR

To change only Row 2

VERB 22	ENTR
+XX.XXX (Test site latitude from Table 1)	ENTR

9. Perform the following DSKY operations:

VERB 33	ENTR

Observe the PROG lamp changes from 01 after approximately 90 seconds to 05 for approximately 5 minutes, then to 02 for the remainder of the test.

TEST RESULTS AT 2 HRS

10. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall light. After 120 minutes have elapsed since initiation of step 9, set the OPTICS MODE switch on the Indicator Control panel to ZERO.

11. Perform the following DSKY operations:

VERB 52	ENTR

Observe the PROG lamp changes to 03.

TARGET #1 AZ AND ELEV

12. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000

Row 2 displays +00000

If the display is correct proceed to step 14, if not, proceed to step 13.

13. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24	ENTR
+18000	ENTR
+00000	ENTR

14. Perform the following DSKY operation:

VERB 33	ENTR

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JOB GYRO COMPASSING

JDC 12222 REV G PAGE 3 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

TARGET #4 AZ AND ELEV

15. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +13500

Row 2 displays +00000

If display is correct proceed to step 17, if not, proceed to step 16.

16. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24	ENTR
+13500	ENTR
+00000	ENTR

17. Perform the following DSKY operations:

VERB 33	ENTR

MARK ON TARGET #1

18. Set the OPTICS MODE switch on the Indicator Control panel to MAN and the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 180.0° and 32.5° respectively.

19. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT reticle pattern is centered on the target #1 pattern. Press the MARK pushbutton. If MARK was satisfactory, proceed to the next step, if not press MARK REJECT and repeat this step.

MARK ON TARGET #4

20. Set the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

21. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT reticle pattern is centered on the target #4 pattern. Press the MARK pushbutton. If MARK was satisfactory, press ENTR and proceed to next step, if not, press MARK REJECT and repeat this step.

X, Y, Z GYRO ERRORS

22. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

23. Perform the following DSKY operations:

VERB 34	ENTR

Observe the PROG lamp changes to 02. Set the OPTICS MODE switch to ZERO.

24. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

25. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 25.8 (+0.25, -0 vdc). Record the indication.

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Chg. 7-23-65

JOB GYRO COMPASSING

JDC 12222 REV G PAGE 4 OF 4

SUBSYSTEM G & N SYSTEM

ASSY

26. Repeat step 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 31.8 (+0, -0.25 vdc). Record the indication.

28. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

29. Perform the following DSKY operations:

VERB 36	ENTR

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc. Press OPTICS POWER ON pushbutton on Test Control panel and OPTICS POWER ON pushbutton shall go out.

31. Perform the calculations on the calculation sheet and complete the data sheets.

32. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development
DIV #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

Table 1

Latitude of Test Site

Location	Latitude λ	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
KSC	28.516	.87868
NAA	33.921	.82985

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8

JDC
NO. 12222
REV. G
INITIAL TDRR 29582

JOB GYRO COMPASSING

ASSEMBLY UNDER TEST

TITLE ____________________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________________ SER. NO. ________ CAL DATE
NAME ____________________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2	IMU OPERATE BUS, 28VDC	volts dc	28.3		29.3			a
22	X Gyro elevation error Row 1 (+2 HRS)	degrees	-.06	( ) __.___	+.06			b
	Y Gyro elevation error Row 2 (+2 HRS)	degrees	-.06	( ) __.___	+.06			c
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			d
24 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			e
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			f

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 8

JDC
NO. 12222
REV. G

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			g
24 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			h
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			i
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			j
24 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			k
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			l
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			m
24 (60 min)	X Gyro elevation error Row 1 (+3 HRS)	degrees	▨	( ) __.___	▨			n

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 8

JDC
NO. 12222
REV. G

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2 (+3 HRS)	degrees	▨	( ) __.___	▨			o
	Z Gyro azimuth error Row 3 (+3 HRS)	degrees	▨	( ) __.___	▨			p
25	IMU OPERATE BUS 28 VDC	volts dc	25.8		26.06			q
26 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			r
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			s
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			t
26 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			u
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			v
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			w

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 8

JDC
NO. 12222
REV. G

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
26 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			x
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			y
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			z
26 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			aa
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ab
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ac
27	IMU OPERATE BUS 28 VDC	volts dc	31.55		31.8			ad
28 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			ae

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12222
REV. G

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			af
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			ag
28 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			ah
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			ai
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			aj
28 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			ak
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			al
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			am

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
NO. 12222
REV. G

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			an
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			ao
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			ap
31	Azimuth error contributed by IRIG coefficients	degrees	▨		▨			aq
31a	Z Gyro azimuth error (corrected) +2 HRS	degrees	-.57		+.57			ar
31b	ΔX Gyro elevation error +3 HRS	degrees	-.03		+.03			as
31c	ΔY Gyro elevation error +3 HRS	degrees	-.03		+.03			at
31d	ΔZ Gyro azimuth error +3 HRS	degrees	-.06		+.06			au
31e	ΔX Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			av

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 8

JDC
NO. 12222
REV. G

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
31f	ΔY Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			aw
31g	ΔZ Gyro azimuth error +4 HRS (LO BUS)	degrees	▨		▨			ax
31h	ΔX Gyro elevation error +5 HRS (HI BUS)		▨		▨			ay
31i	ΔY Gyro elevation error +5 HRS (HI BUS)		▨		▨			az
31j	ΔZ Gyro azimuth error +5 HRS (HI BUS)		▨		▨			ba

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 8

JDC
NO. 12222
REV. G

JOB GYRO COMPASSING

CALCULATIONS SHEET

Record the latest values of the following coefficients from JDC 12217.

NBDX ( ) ____________
NBDY ( ) ____________
NBDZ ( ) ____________
ADIAZ ( ) ____________
ADSRAY ( ) ____________

Perform the following calculations. Cos λ functions are provided in table 1.

Drift (vert) = NBDZ + ADIAZ
Drift (vert) = ( ) ____________ meru

Drift (east) = .707(NBDY + NBDX + ADSRAY)
Drift (east) = ( ) ____________ meru

IRIG COEFFICIENT AZ ERROR CONTRIBUTION

$$\phi\,(\text{vert}) = \frac{D(\text{vert}) \times \frac{12.8}{\text{Cos}\ \lambda} + D(\text{east}) \times \frac{206}{\text{Cos}\ \lambda}}{3600}$$

ϕ (vert) = ( ) ____________ degrees

Record answer on line aq.

Perform the following calculations

a. line d - line aq	record on line ar
b. line b - line n	record on line as
c. line c - line o	record on line at
d. line d - line p	record on line au
e. line b - line aa	record on line av
f. line c - line ab	record on line aw
g. line d - line ac	record on line ax
h. line b - line an	record on line ay
i. line c - line ao	record on line az
j. line d - line ap	record on line ba

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INITIAL TDRR 29882 D.S. PGS 8

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30311	2,4	1-6	EA	WS
B	9-1-66	30926	2,4	-	JP	-
C	11-10-66	31900	2,4	-	EA	-
D	11-15-66	31949	-	6,7	EA	-
E	11-15-66	31953	-	1	EA	-
F	12-28-66	32479	All	2,4,5,8	JP	-
G	9-6-67	34560	1	-	EA	-
H	10-12-67	34829	All	-	EA	-

REFERENCES

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the Gyro Compassing capabilities of the G & N System. The test is is computer controlled. The system is erected with the X Gyro Northeast, the Y Gyro Southeast, and the Z Gyro down. The output of the X and Y PIPA's is used to hold the platform vertical. The Y PIPA and X Gyro comprise the compassing loop. The X and Y gyro elevation errors and the Z gyro azimuth error are checked after a two hour settling period and every 15 minutes thereafter for a period of 3 hours, using optical verification. The test takes approximately 5 hours to perform. From the third to the fourth hour, the prime power is set to the LO limit. From the fourth to the fifth hour the prime power is set to the HI limit.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization condition. Insure that G&N Mounting Fixture is tilted to 32.5°.

VOLTAGE SETTING (NOMINAL)

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

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---

the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc. Record the indication.

TEST ENTRY

3. Perform the following DSKY operations:

VERB 57 ENTR
00006 ENTR

Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of the DSKY displays +04500. If the display is correct proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations To change only Row 1:

VERB 21 ENTR
+04500 ENTR

6. Perform the following DSKY operation:

VERB 33 ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +XX.XXX (Test site latitude from Table 1)

If the display is correct proceed to step 9, if not proceed to step 8.

8. Perform the following DSKY operations To change only Row 1:

VERB 21 ENTR
+18000 ENTR

To change only Row 2

VERB 22 ENTR
+XX.XXX (Test site latitude from Table 1) ENTR

9. Perform the following DSKY operations:

VERB 33 ENTR

Observe the PROG lamp changes from 01 after approximately 90 seconds to 05 for approximately 5 minutes, then to 02 for the remainder of the test.

TEST RESULTS AT 2 HRS

10. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

NOTE: Perform step 11 when 120 minutes has elapsed since initiation of step 9. Complete steps 11 through 23 as rapidly as possible. Recommended time for completion of these steps is three minutes.

11. Perform the following DSKY operations:

VERB 52 ENTR

Observe the PROG lamp changes to 03.

TARGET #1 AZ AND ELEV

12. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +00000

If the display is correct proceed to step 14, if not, proceed to step 13.

---

13. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24 ENTR
+18000 ENTR
+00000 ENTR

14. Perform the following DSKY operation:

VERB 33 ENTR

TARGET #4 AZ AND ELEV

15. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +13500
Row 2 displays +00000

If display is correct proceed to step 17, if not, proceed to step 16.

16. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24 ENTR
+13500 ENTR
+00000 ENTR

17. Perform the following DSKY operations:

VERB 33 ENTR

MARK ON TARGET #1

18. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF, set OPTICS MODE switch to MAN, and set OPTICS SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 180.0° and 32.5° respectively.

19. Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT reticle pattern is centered on the target #1 pattern. Press the MARK pushbutton. If MARK was satisfactory, proceed to the next step, if not press MARK REJECT and repeat this step.

MARK ON TARGET #4

20. Set the OPTICS SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

21. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive the optics until the SXT reticle pattern is centered on the target #4 pattern. Press the MARK pushbutton.

21A. If MARK was satisfactory in previous step, press ENTR pushbutton on DSKY and proceed to next step; if not, press MARK REJECT pushbutton on Indicator Control panel and repeat step 21 and this step.

X, Y, Z GYRO ERRORS

22. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

23. Perform the following DSKY operations:

VERB 34 ENTR

Observe the PROG lamp changes to 02. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

24. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

25. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 25.8 (+0.25, -0 vdc). Record the indication.

26. Repeat step 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 31.8 (+0, -0.25 vdc). Record the indication.

28. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

29. Perform the following DSKY operations:

VERB 36 ENTR

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.8 (±0.5) vdc. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

31. Perform the calculations on the calculation sheet and complete the data sheets.

32. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development
DIV #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

Table 1

Latitude of Test Site		
Location	Latitude λ	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
KSC	28.516	.87868
NAA	33.921	.82985

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. H
INITIAL TDRR 29582

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2	IMU OPERATE BUS, 28VDC	volts dc	28.3		29.3			a
22	X Gyro elevation error Row 1 (+2 HRS)	degrees	-.06	( ) __.___	+.06			b
	Y Gyro elevation error Row 2 (+2 HRS)	degrees	-.06	( ) __.___	+.06			c
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			d
24 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			e
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			f

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EQUIPMENT TEST
DATA SHEET 2 OF 8
JOB GYRO COMPASSING

JDC
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REV. H

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			g
24 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			h
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			i
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			j
24 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			k
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			l
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			m
24 (60 min)	X Gyro elevation error Row 1 (+3 HRS)	degrees	▨	( ) __.___	▨			n

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 8
JOB GYRO COMPASSING

JDC
NO. 12222
REV. H

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2 (+3 HRS)	degrees	▨	( ) __.___	▨			o
	Z Gyro azimuth error Row 3 (+3 HRS)	degrees	▨	( ) __.___	▨			p
25	IMU OPERATE BUS 28 VDC	volts dc	25.8		26.05			q
26 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			r
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			s
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			t
26 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			u
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			v
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			w

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 8
JOB GYRO COMPASSING

JDC
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
26 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			x
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			y
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			z
26 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			aa
	Y Gyro elevation error Row 2	degrees	▨	( ) __.___	▨			ab
	Z Gyro azimuth error Row 3	degrees	▨	( ) __.___	▨			ac
27	IMU OPERATE BUS 28 VDC	volts dc	31.55		31.8			ad
28 (15 min)	X Gyro elevation error Row 1	degrees	▨	( ) __.___	▨			ae

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EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12222
REV. H

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			af
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			ag
28 (30 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			ah
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			ai
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			aj
28 (45 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			ak
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			al
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			am

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EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
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JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28 (60 min)	X Gyro elevation error Row 1	degrees	▨	( ) ___.___	▨			an
	Y Gyro elevation error Row 2	degrees	▨	( ) ___.___	▨			ao
	Z Gyro azimuth error Row 3	degrees	▨	( ) ___.___	▨			ap
31	Azimuth error contributed by IRIG coefficients	degrees	▨		▨			aq
31a	Z Gyro azimuth error (corrected) +2 HRS	degrees	-.57		+.57			ar
31b	ΔX Gyro elevation error +3 HRS	degrees	-.03		+.03			as
31c	ΔY Gyro elevation error +3 HRS	degrees	-.03		+.03			at
31d	ΔZ Gyro azimuth error +3 HRS	degrees	-.06		+.06			au
31e	ΔX Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			av

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EQUIPMENT TEST
DATA SHEET 7 OF 8

JDC
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REV. H

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
31f	ΔY Gyro elevation error +4 HRS (LO BUS)	degrees	▨		▨			aw
31g	ΔZ Gyro azimuth error +4 HRS (LO BUS)	degrees	▨		▨			ax
31h	ΔX Gyro elevation error +5 HRS (HI BUS)		▨		▨			ay
31i	ΔY Gyro elevation error +5 HRS (HI BUS)		▨		▨			az
31j	ΔZ Gyro azimuth error +5 HRS (HI BUS)		▨		▨			ba

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 8

JDC
NO. 12222
REV. H

JOB GYRO COMPASSING

CALCULATIONS SHEET

Record the latest values of the following coefficients from JDC 12217.

NBDX ( ) ____________
NBDY ( ) ____________
NBDZ ( ) ____________
ADIAZ ( ) ____________
ADSRAY ( ) ____________

Perform the following calculations. Cos λ functions are provided in table 1.

Drift (vert) = NBDZ + ADIAZ
Drift (vert) = ( ) ____________ meru
Drift (east) = .707(NBDY + NBDX + ADSRAY)
Drift (east) = ( ) ____________ meru

IRIG COEFFICIENT AZ ERROR CONTRIBUTION

$$\phi\,(\text{vert}) = \frac{D(\text{vert}) \times \frac{12.8}{\text{Cos}\ \lambda} + D(\text{east}) \times \frac{206}{\text{Cos}\ \lambda}}{3600}$$

φ (vert) = ( ) ____________ degrees

Record answer on line aq.

Perform the following calculations

a.	line d - line aq	record on line ar
b.	line b - line n	record on line as
c.	line c - line o	record on line at
d.	line d - line p	record on line au
e.	line b - line aa	record on line av
f.	line c - line ab	record on line aw
g.	line d - line ac	record on line ax
h.	line b - line an	record on line ay
i.	line c - line ao	record on line az
j.	line d - line ap	record on line ba

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INITIAL TDRR 29882 D.S. PGS 12

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30311	2,4	1-6	EA	WS
B	9-1-66	30926	2,4	-	JP	-
C	11-10-66	31900	2,4	-	EA	-
D	11-15-66	31949	-	6,7	EA	-
E	11-15-66	31953	-	1	EA	-
F	12-28-66	32479	All	2,4,5,8	JP	-
G	9-6-67	34560	1	-	EA	-
H	10-12-67	34829	All	-	EA	-
J	11-10-67	35033	All	All	EA	-

REFERENCES

IMPORTANT

See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the gyrocompassing capabilities of the G and N system. The IMU stable member is coarse aligned to place the X gyro approximately northeast, the Y gyro approximately southeast, and the Z gyro approximately vertical and down. The gyros are then torqued at earth rate for the remainder of the test.

After five minutes of Vertical Erect (Major Mode 05), where the outputs of the X and Y PIPA's are used to position the Z gyro closer to vertical, gyrocompassing (Major Mode 02) is automatically initiated. During gyrocompassing the outputs of the X and Y PIPA's are used by the computer to calculate torquing commands to all three gyros in order to hold the stable member in a constant attitude with respect

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB GYRO COMPASSING

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SUBSYSTEM G&N SYSTEM

ASSY

to the earth. The system is gyrocompassed at nominal bus voltage for the first 4 1/2 hours then at low bus voltage for one hour and at high bus voltage for one hour. CDU data is recorded approximately every ten minutes for the duration of the test (about 6 1/2 hours) to evaluate the dynamics of the gyrocompass. At the four hour point the accuracy of the gyrocompass is determined by using the Optical Verification Routine (Major Mode 03).

IMPORTANT: 1. When a specific time is given for performing procedural steps, such times must be adhered to within plus or minus one minute.

2. When time is to be recorded on data sheets, record the time to the nearest minute.

3. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization Condition. Insure that G&N Mounting Fixture is tilted to 32.5°.

VOLTAGE SETTING (NOMINAL)

2. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control Panel until DVM indicates 28.8 (±0.5) vdc. Record indication.

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00006 ENTR

c. Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of DSKY displays +04500. If display is correct, proceed to step 6; if not, proceed to step 5.

5. Perform the following DSKY operations to change only Row 1:

a. VERB 21 ENTR

b. +04500 ENTR

6. Perform the following DSKY operations:

VERB 33 ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +18000

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JOB GYRO COMPASSING

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SUBSYSTEM G & N SYSTEM

ASSY

b. Row 2 +XX.XX (Test site latitude from Table 1)

If display is correct, proceed to step 9; if not, proceed to step 8.

8. Perform the following DSKY operations:

To change only Row 1--

VERB 21 ENTR

+18000 ENTR

To change only Row 2--

VERB 22 ENTR

+XX.XXX (Test site latitude from Table 1) ENTR

9. Perform the following DSKY operation:

VERB 33 ENTR

Observe PROG lamp changes from 01 after approximately 90 seconds to 05 for approximately 5 minutes, then to 02. Record exact time of day PROG lamp changes to 02, then proceed immediately to step 10.

RECORDING CDU ANGLES

10. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR

b. Record time of ENTR.

c. Record Row 1, Row 2, and Row 3 indications.

Repeat a, b, and c above at ten minute intervals for the remainder of the test. Adhere to the ten minute intervals as closely as possible without interferring with the time requirements of steps 11, 28, and 29.

TEST RESULTS AT FOUR HOURS

NOTE: Perform step 11 four hours after the time recorded in step 9. Complete steps 11 through 27 as rapidly as possible. Recommended time for completion of these steps is three minutes.

11. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

12. Perform the following DSKY operation:

VERB 52 ENTR

Observe PROG lamp changes to 03.

13. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +18000

b. Row 2 +00000

If display is correct, proceed to step 15; if not, proceed to step 14.

14. Perform the following DSKY operations to change Row 1 and Row 2:

a. VERB 24 ENTR

b. +18000 ENTR

c. +00000 ENTR

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SUBSYSTEM G & N SYSTEM

ASSY

15. Perform the following DSKY operation:

VERB 33 ENTR

16. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +13500

b. Row 2 +00000

If display is correct proceed to step 18; if not, proceed to step 17.

17. Perform the following DSKY operations to change Row 1 and Row 2:

a. VERB 24 ENTR

b. +13500 ENTR

c. +00000 ENTR

18. Perform the following DSKY operation:

VERB 33 ENTR

19. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF. Set OPTICS MODE switch to MAN, and set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive optics until Shaft and Trunnion counters on TPAC indicate 180.0° and 32.5° respectively.

20. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive optics until SXT reticle pattern is centered on target #1 pattern. Press MARK pushbutton. If MARK was satisfactory, proceed to next step; if not, press MARK REJECT and repeat this step.

21. Set the OPTICS SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

22. Set OPTICS SPEED switch to LO. Using Optics Hand Controller drive optics until SXT reticle pattern is centered on target #4 pattern. Press MARK pushbutton.

23. If MARK was satisfactory in previous step, press ENTR pushbutton on DSKY and proceed to next step; if not, press MARK REJECT pushbutton on Indicator Control panel and repeat step 22 and this step.

X, Y, Z GYRO ERRORS

24. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

25. Perform the following DSKY operation:

VERB 34 ENTR

Observe the PROG lamp changes to 02.

26. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

27. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

NOTE: Perform step 28 4-1/2 hours after the time recorded in step 9.

28. Set CROSSBAR CONTROL on the

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Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 25.8 (+0.25, -0 vdc). Record indication and time.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

NOTE: Perform step 29 5-1/2 hours after the time recorded in step 9.

29. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 31.8 (+0, -0.25 vdc). Record indication and time.

TEST TERMINATION

NOTE: Perform step 30 6-1/2 hours after the time recorded in step 9.

30. Perform the following DSKY operation:

VERB 36 ENTR

31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc.

CALCULATIONS

32. Record most recent values of BD_X, BD_Y, BD_Z, $ADIA_Z$ $ADSRA_Y$, A_{B_X}, and A_{B_Y} from JDC 12217 in CALCULATIONS portion of data sheets.

33. Calculate and record leveling error contributed by A_{B_Y} as θ_X and leveling error contributed by A_{B_X} as θ_Y as follows:

a. $\theta_X = \dfrac{-57.3\ A_{B_Y}}{g}$ degrees

b. $\theta_Y = \dfrac{57.3\ A_{B_X}}{g}$ degrees

where g is local gravity obtained from Table 2.

34. Calculate and record azimuth error contributed by IRIG drift as θ_Z as follows:

$$\theta_Z = \frac{D(vert) \times \frac{12.8}{\cos\lambda} + D(east) \frac{206}{\cos\lambda} \text{ deg}}{3600}$$

where: $D(vert) = BD_Z + ADIA_Z$ meru, $D(east) = .707(BD_Y + BD_X + ADSRA_Y)$ meru, and cos λ is cosine of test site latitude obtained from Table 1.

35. Calculate and record compensated X and Y leveling errors at four hour point as follows:

a. Compensated X leveling error = Row 1 indication of step 24 - θ_X degrees

b. Compensated Y leveling error = Row 2 indication of step 24 - θ_Y degrees

36. Calculate compensated Z azimuth error at four hour point as follows:

Z azimuth error = Row 3 indication of step 24 - θ_Z degrees

---

37. Calculate maximum data spread of all XCDU (Row 1) data recorded between 2 hours and 4 hours after the time recorded in step 9.

38. Calculate maximum data spread of all YCDU (Row 2) data recorded between 2 hours and 4 hours after the time recorded in step 9.

39. Calculate maximum data spread of all ZCDU (Row 3) data recorded between 2 hours and 4 hours after the time recorded in step 9.

40. Calculate maximum data spread of all XCDU (Row 1) data recorded between the time recorded in step 28 and the time recorded in step 29.

41. Calculate maximum data spread of all YCDU (Row 2) data recorded between the time recorded in step 28 and the time recorded in step 29.

42. Calculate maximum data spread of all ZCDU (Row 3) data recorded between the time recorded in step 28 and the time recorded in step 29.

43. Calculate maximum data spread of all XCDU (Row 1) data recorded after the time recorded in step 29.

44. Calculate maximum data spread of all YCDU (Row 2) data recorded after the time recorded in step 29.

45. Calculate maximum data spread of all ZCDU (Row 3) data recorded after the time recorded in step 29.

46. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development Div.
Mail Station #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts. 01242

Table 1

Latitude of Test Site

Location	Latitude	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75784
MSC	29.556	.86993
KSC	28.516	.87868
NAA	33.921	.82985

Table 2

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 12

JDC
NO. 12222
REV J
INITIAL TDRR 29882

JOB GYRO COMPASSING

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ________	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________________ SER. NO. ______ CAL DATE
NAME ________________ SER. NO. ______ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2	IMU Operate bus	Volts dc	28.3		29.3		
9	Time	▨	▨	__hrs __ __min	▨		
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 12

JDC
NO. 12222
REV J

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	__hrs __ __min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 12

JDC
NO. 12222
REV. J

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		

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EQUIPMENT TEST
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JDC
NO. 12222
REV. J

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	___hrs___ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		

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JDC
NO. 12222
REV. J

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		

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JDC
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JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		___hrs___ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		

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EQUIPMENT TEST
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JOB GYRO COMPASSING

JDC
NO. 12222
REV. J

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time		▨	__ hrs __ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) __ . __	▨		
	Row 2 (Y CDU)	degrees	▨	( ) __ . __	▨		
	Row 3 (Z CDU)	degrees	▨	( ) __ . __	▨		
24	Row 1 (X leveling error)	degrees	▨	( ) __ . __	▨		
	Row 2 (Y leveling error)	degrees	▨	( ) __ . __	▨		
	Row 3 (Z azimuth error)	degrees	▨	( ) __ . __	▨		
28	IMU Operate bus	Volts dc	▨		▨		
	Time		▨	__ hrs __ min	▨		
29	IMU Operate bus	Volts dc	▨		▨		
	Time		▨	__ hrs __ min	▨		
33.a	θ_X leveling error	degrees	▨		▨		
33.b	θ_Y leveling error	degrees	▨		▨		
34	θ_Z azimuth error	degrees	▨		▨		
35.a	Compensated X leveling error (4 Hours)	degrees	-0.045		+0.045		
35.b	Compensated Y leveling error (4 Hours)	degrees	-0.045		+0.045		
36	Compensated Z leveling error (4 Hours)	degrees	-0.573		+0.573		

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EQUIPMENT TEST
DATA SHEET 8 **OF** 12
JOB GYRO COMPASSING

JDC
NO. 12222
REV. J

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
37	X CDU data spread (Nominal Bus)	degrees	▨		0.12		
38	Y CDU data spread (Nominal Bus)	degrees	▨		0.06		
39	Z CDU data spread (Nominal Bus)	degrees	▨		0.06		
40	X CDU data spread (Lo Bus)	degrees	▨		0.30		
41	Y CDU data spread (Lo Bus)	degrees	▨		0.09		
42	Z CDU data spread (Lo Bus)	degrees	▨		0.09		
43	X CDU data spread (Hi Bus)	degrees	▨		0.60		
44	Y CDU data spread (Hi Bus)	degrees	▨		0.18		
45	Z CDU data spread (Hi Bus)	degrees	▨		0.18		

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APOLLO G&N
EQUIPMENT TEST
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JOB GYRO COMPASSING

JDC
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JDC ITEM NO.	CALCULATIONS
32	BD_X ( ) ______ meru BD_Y ( ) ______ meru BD_Z ( ) ______ meru $ADIA_Z$ ( ) ______ meru/g $ADSRA_Y$ ( ) ______ meru/g A_{B_X} ( ) ______ cm/sec^2 A_{B_Y} ( ) ______ cm/sec^2
33.a	$\theta_X = \frac{-57.3\ A_{B_Y}}{g}$ degrees $\theta_X =$
33.b	$\theta_Y = \frac{57.3\ A_{B_X}}{g}$ degrees $\theta_Y =$

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EQUIPMENT TEST
DATA SHEET 10 **OF** 12
JOB GYRO COMPASSING

JDC
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JDC ITEM NO.	CALCULATIONS
34	$D(vert) = BD_Z + ADIA_Z$ degrees $D(vert) =$
	$D(east) = .707\ (BD_Y + BD_X + ADSRA_Y)$ meru $D(east) =$
	$\theta_Z = \frac{\overset{\underline{12.8}}{D(vert)} \text{ x } \cos\lambda + \overset{\underline{206}}{D(east)} \text{ x } \cos\lambda}{3600}$ degrees $\theta_Z =$

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EQUIPMENT TEST
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JOB GYRO COMPASSING

JDC
NO. 12222
REV. J

JDC ITEM NO.	CALCULATIONS	
35.a	X leveling error = Step 24 (Row 1) - θ_X X leveling error =	degrees
35.b	Y leveling error = Step 24 (Row 2) - θ_Y Y leveling error =	degrees
36	Z azimuth error = Step 24 (Row 3) - θ_Z Z azimuth error =	degrees
37	X CDU data spread (Nominal Bus) =	degrees

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 12 **OF** 12

JOB GYRO COMPASSING

JDC
NO. 12222
REV. J

JDC ITEM NO.	CALCULATIONS	
38	Y CDU data spread (Nominal Bus) =	degrees
39	Z CDU data spread (Nominal Bus) =	degrees
40	X CDU data spread (Lo Bus) =	degrees
41	Y CDU data spread (Lo Bus) =	degrees
42	Z CDU data spread (Lo Bus) =	degrees
43	X CDU data spread (Hi Bus) =	degrees
44	Y CDU data spread (Hi Bus) =	degrees
45	Z CDU data spread (Hi Bus) =	degrees

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JOB GYRO COMPASSING

JDC 12222 REV. K PAGE 1 OF 6

INITIAL TDRR 29882 D.S. PGS. 12

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30311	2,4	1-6	EA	WS
B	9-1-66	30926	2,4	-	JP	-
C	11-10-66	31900	2,4	-	EA	-
D	11-15-66	31949	-	6,7	EA	-
E	11-15-66	31953	-	1	EA	-
F	12-28-66	32479	All	2,4,5,8	JP	-
G	9-6-67	34560	1	-	EA	-
H	10-12-67	34829	All	-	EA	-
J	11-10-67	35033	All	All	EA	-
K	4-5-68	36041	2,3	7,10	EA	-

REFERENCES

IMPORTANT

See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the gyrocompassing capabilities of the G and N system. The IMU stable member is coarse aligned to place the X gyro approximately northeast, the Y gyro approximately southeast, and the Z gyro approximately vertical and down. The gyros are then torqued at earth rate for the remainder of the test.

After five minutes of Vertical Erect (Major Mode 05), where the outputs of the X and Y PIPA's are used to position the Z gyro closer to vertical, gyrocompassing (Major Mode 02) is automatically initiated. During gyrocompassing the outputs of the X and Y PIPA's are used by the computer to calculate torquing commands to all three gyros in order to hold the stable member in a constant attitude with respect

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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to the earth. The system is gyrocompassed at nominal bus voltage for the first 4 1/2 hours then at low bus voltage for one hour and at high bus voltage for one hour. CDU data is recorded approximately every ten minutes for the duration of the test (about 6 1/2 hours) to evaluate the dynamics of the gyrocompass. At the four hour point the accuracy of the gyrocompass is determined by using the Optical Verification Routine (Major Mode 03).

IMPORTANT: 1. When a specific time is given for performing procedural steps, such times must be adhered to within plus or minus one minute.

2. When time is to be recorded on data sheets, record the time to the nearest minute.

3. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

4. The TRUNNION TPAC on the OUA must indicate between 0 and 5 degrees before the OUA is commanded to zero. Manipulate the Optics Hand Controller on the Indicator Control panel vertically to drive the trunnion axis in a decreasing direction until the TRUNNION TPAC indicates between 0 and 5 degrees. The OPTICS SPEED switch may be adjusted to facilitate positioning the trunnion axis. Do not drive the trunnion axis through zero to the negative limit stop.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization Condition. Insure that G&N Mounting Fixture is tilted to 32.5°.

VOLTAGE SETTING (NOMINAL)

2. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control Panel until DVM indicates 28.8 (±0.5) vdc. Record indication.

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00006 ENTR

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c. Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of DSKY displays +04500. If display is correct, proceed to step 6; if not, proceed to step 5.

5. Perform the following DSKY operations to change only Row 1:

a. VERB 21 ENTR
b. +04500 ENTR

6. Perform the following DSKY operations:

VERB 33 ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +18000
b. Row 2 +XX.XXX (Test site latitude from Table 1)

If display is correct, proceed to step 9; if not, proceed to step 8.

8. Perform the following DSKY operations:

To change only Row 1--

VERB 21 ENTR
+18000 ENTR

To change only Row 2--

VERB 22 ENTR
+XX.XXX (Test site latitude from Table 1) ENTR

9. Perform the following DSKY operation:

VERB 33 ENTR

Observe PROG lamp changes from 01 after approximately 90 seconds to 05 for approximately 5 minutes, then to 02. Record exact time of day PROG lamp changes to 02, then proceed immediately to step 10.

RECORDING CDU ANGLES

10. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR
b. Record time of ENTR.
c. Record Row 1, Row 2, and Row 3 indications.

Repeat a, b, and c above at ten minute intervals for the remainder of the test. Adhere to the ten minute intervals as closely as possible without interfering with the time requirements of steps 11, 28, and 29.

TEST RESULTS AT FOUR HOURS

NOTE: Perform step 11 four hours after the time recorded in step 9. Complete steps 11 through 27 as rapidly as possible. Recommended time for completion of these steps is three minutes.

11. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

12. Perform the following DSKY

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operation:

VERB 52 ENTR

Observe PROG lamp changes to 03.

13. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +18000
b. Row 2 +00000

If display is correct, proceed to step 15; if not, proceed to step 14.

14. Perform the following DSKY operations to change Row 1 and Row 2:

a. VERB 24 ENTR
b. +18000 ENTR
c. +00000 ENTR

15. Perform the following DSKY operation:

VERB 33 ENTR

16. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +13500
b. Row 2 +00000

If display is correct proceed to step 18; if not, proceed to step 17.

17. Perform the following DSKY operations to change Row 1 and Row 2:

a. VERB 24 ENTR
b. +13500 ENTR
c. +00000 ENTR

18. Perform the following DSKY operation:

VERB 33 ENTR

19. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF. Set OPTICS MODE switch to MAN, and set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive optics until Shaft and Trunnion counters on TPAC indicate 180.0° and 32.5° respectively.

20. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive optics until SXT reticle pattern is centered on target #1 pattern. Press MARK pushbutton. If MARK was satisfactory, proceed to next step; if not, press MARK REJECT and repeat this step.

21. Set the OPTICS SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

22. Set OPTICS SPEED switch to LO. Using Optics Hand Controller drive optics until SXT reticle pattern is centered on target #4 pattern. Press MARK pushbutton.

23. If MARK was satisfactory in previous step, press ENTR pushbutton on DSKY and proceed to next step; if not, press MARK REJECT pushbutton on Indicator Control panel and repeat step 22 and this step.

X, Y, Z GYRO ERRORS

24. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

25. Perform the following DSKY operation:

VERB 34 ENTR

Observe the PROG lamp changes to 02.

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26. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

27. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

NOTE: Perform step 28 4-1/2 hours after the time recorded in step 9.

28. Set CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 25.8 (+0.25, -0 vdc). Record indication and time.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

NOTE: Perform step 29 5-1/2 hours after the time recorded in step 9.

29. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 31.8 (+0, -0.25 vdc). Record indication and time.

TEST TERMINATION

NOTE: Perform step 30 6-1/2 hours after the time recorded in step 9.

30. Perform the following DSKY operation:

VERB 36 ENTR

31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc.

CALCULATIONS

32. Record most recent values of BD_X, BD_Y, BD_Z, $ADIA_Z$ $ADSRA_Y$, A_{B_X}, and A_{B_Y} from JDC 12217 in CALCULATIONS portion of data sheets.

33. Calculate and record leveling error contributed by A_{B_Y} as θ_X and leveling error contributed by A_{B_X} as θ_Y as follows:

a. $$\theta_X = \frac{-57.3\ A_{B_Y}}{g} \text{ degrees}$$

b. $$\theta_Y = \frac{57.3\ A_{B_X}}{g} \text{ degrees}$$

where g is local gravity obtained from Table 2.

34. Calculate and record azimuth error contributed by IRIG drift as θ_Z as follows:

$$\theta_Z = \frac{D(\text{vert}) \times \dfrac{12.8}{\cos\lambda} + D(\text{east}) \dfrac{206}{\cos\lambda \text{ deg}}}{3600}$$

where: $D(\text{vert}) = BD_Z + ADIA_Z$ meru, $D(\text{east}) = .707(BD_Y + BD_X + ADSRA_Y)$ meru, and $\cos\lambda$ is cosine of test site latitude obtained from Table 1.

35. Calculate and record compensated X and Y leveling errors at four hour point as follows:

a. Compensated X leveling error = Row 1 indication of step 24 - θ_X degrees

b. Compensated Y leveling error = Row 2 indication of step 24 - θ_Y degrees

---

36. Calculate compensated Z azimuth error at four hour point as follows:

Z azimuth error = Row 3 indication of step 24 - θ_Z degrees

37. Calculate maximum data spread of all XCDU (Row 1) data recorded between 2 hours and 4 hours after the time recorded in step 9.

38. Calculate maximum data spread of all YCDU (Row 2) data recorded between 2 hours and 4 hours after the time recorded in step 9.

39. Calculate maximum data spread of all ZCDU (Row 3) data recorded between 2 hours and 4 hours after the time recorded in step 9.

40. Calculate maximum data spread of all XCDU (Row 1) data recorded between the time recorded in step 28 and the time recorded in step 29.

41. Calculate maximum data spread of all YCDU (Row 2) data recorded between the time recorded in step 28 and the time recorded in step 29.

42. Calculate maximum data spread of all ZCDU (Row 3) data recorded between the time recorded in step 28 and the time recorded in step 29.

43. Calculate maximum data spread of all XCDU (Row 1) data recorded after the time recorded in step 29.

44. Calculate maximum data spread of all YCDU (Row 2) data recorded after the time recorded in step 29.

45. Calculate maximum data spread of all ZCDU (Row 3) data recorded after the time recorded in step 29.

46. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development Div.
Mail Station #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts. 01242

Table 1

Latitude of Test Site		
Location	Latitude	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
KSC	28.516	.87868
NAA	33.921	.82985

Table 2

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 12

NO. 12222 JDC
REV K
INITIAL TDRR 29882

JOB GYRO COMPASSING

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME / AFFILIATION APPROVED BY ______ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2	IMU Operate bus	Volts dc	28.3		29.3		
9	Time			___hrs ___ min			
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 12

JDC
NO. 12222
REV K

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			
10	Time			___hrs ___ min			
	Row 1 (X CDU)	degrees		( )____.___			
	Row 2 (Y CDU)	degrees		( )____.___			
	Row 3 (Z CDU)	degrees		( )____.___			

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EQUIPMENT TEST
DATA SHEET 3 **OF** 12

JOB GYRO COMPASSING

JDC
NO. 12222
REV K

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )____.___	▨		

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EQUIPMENT TEST
DATA SHEET 4 **OF** 12

JOB GYRO COMPASSING

JDC
NO. 12222
REV K

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		

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EQUIPMENT TEST
DATA SHEET 5 **OF** 12

JOB GYRO COMPASSING

JDC
NO. 12222
REV K

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		

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EQUIPMENT TEST
DATA SHEET 6 **OF** 12

JOB GYRO COMPASSING

JDC
NO. 12222
REV K

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )____.___	▨		
	Row 2 (Y CDU)	degrees		( )____.___	▨		
	Row 3 (Z CDU)	degrees		( )____.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )____.___	▨		
	Row 2 (Y CDU)	degrees		( )____.___	▨		
	Row 3 (Z CDU)	degrees		( )____.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )____.___	▨		
	Row 2 (Y CDU)	degrees		( )____.___	▨		
	Row 3 (Z CDU)	degrees		( )____.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )____.___	▨		
	Row 2 (Y CDU)	degrees		( )____.___	▨		
	Row 3 (Z CDU)	degrees		( )____.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )____.___	▨		
	Row 2 (Y CDU)	degrees		( )____.___	▨		
	Row 3 (Z CDU)	degrees		( )____.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )____.___	▨		
	Row 2 (Y CDU)	degrees		( )____.___	▨		
	Row 3 (Z CDU)	degrees		( )____.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )____.___	▨		
	Row 2 (Y CDU)	degrees		( )____.___	▨		
	Row 3 (Z CDU)	degrees		( )____.___	▨		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 12
JOB GYRO COMPASSING

JDC
NO. 12222
REV. K

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time		▨	___ hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ____.___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ____.___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ____.___	▨		
24	Row 1 (X leveling error)	degrees	▨	( ) ___.___	▨		
	Row 2 (Y leveling error)	degrees	▨	( ) ___.___	▨		
	Row 3 (Z azimuth error)	degrees	▨	( ) ___.___	▨		
28	IMU Operate bus	Volts dc	▨		▨		
	Time		▨	___ hrs ___ min	▨		
29	IMU Operate bus	Volts dc	▨		▨		
	Time		▨	___ hrs ___ min	▨		
33.a	θ_X leveling error	degrees	▨		▨		
33.b	θ_Y leveling error	degrees	▨		▨		
34	θ_Z azimuth error	degrees	▨		▨		
35.a	Compensated X leveling error (4 Hours)	degrees	-0.045		+0.045		
35.b	Compensated Y leveling error (4 Hours)	degrees	-0.045		+0.045		
36	Compensated Z Azimuth error (4 Hours)	degrees	-0.573		+0.573		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 12
JOB GYRO COMPASSING

JDC
NO. 12222
REV. K

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
37	X CDU data spread (Nominal Bus)	degrees	▨		0.12		
38	Y CDU data spread (Nominal Bus)	degrees	▨		0.06		
39	Z CDU data spread (Nominal Bus)	degrees	▨		0.06		
40	X CDU data spread (Lo Bus)	degrees	▨		0.30		
41	Y CDU data spread (Lo Bus)	degrees	▨		0.09		
42	Z CDU data spread (Lo Bus)	degrees	▨		0.09		
43	X CDU data spread (Hi Bus)	degrees	▨		0.60		
44	Y CDU data spread (Hi Bus)	degrees	▨		0.18		
45	Z CDU data spread (Hi Bus)	degrees	▨		0.18		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 **OF** 12
JOB GYRO COMPASSING

JDC
NO. 12222
REV. K

JDC ITEM NO.	CALCULATIONS
32	BD_X ( ) ______________ meru BD_Y ( ) ______________ meru BD_Z ( ) ______________ meru $ADIA_Z$ ( ) ______________ meru/g $ADSRA_Y$ ( ) ______________ meru/g A_{B_X} ( ) ______________ cm/sec^2 A_{B_Y} ( ) ______________ cm/sec^2
33.a	$\theta_X = \frac{-57.3\ A_{B_Y}}{g}$ degrees $\theta_X =$
33.b	$\theta_Y = \frac{57.3\ A_{B_X}}{g}$ degrees $\theta_Y =$

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 **OF** 12
JOB GYRO COMPASSING

JDC
NO. 12222
REV. K

JDC ITEM NO.	CALCULATIONS
34	$D(vert) = BD_Z + ADIA_Z$ meru $D(vert) =$
	$D(east) = .707\ (BD_Y + BD_X + ADSRA_Y)$ meru $D(east) =$
	$\theta_Z = \frac{D(vert) \times \left(\frac{12.3}{\cos\lambda}\right) + D(east) \times \left(\frac{206}{\cos\lambda}\right)}{3600}$ degrees $\theta_Z =$

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 11 **OF** 12
JOB GYRO COMPASSING

JDC
NO. 12222
REV. K

JDC ITEM NO.	CALCULATIONS	
35.a	X leveling error = Step 24 (Row 1) - θ_X X leveling error =	degrees
35.b	Y leveling error = Step 24 (Row 2) - θ_Y Y leveling error =	degrees
36	Z azimuth error = Step 24 (Row 3) - θ_Z Z azimuth error =	degrees
37	X CDU data spread (Nominal Bus) =	degrees

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 12 **OF** 12
JOB GYRO COMPASSING

JDC
NO. 12222
REV. K

JDC ITEM NO.	CALCULATIONS	
38	Y CDU data spread (Nominal Bus) =	degrees
39	Z CDU data spread (Nominal Bus) =	degrees
40	X CDU data spread (Lo Bus) =	degrees
41	Y CDU data spread (Lo Bus) =	degrees
42	Z CDU data spread (Lo Bus) =	degrees
43	X CDU data spread (Hi Bus) =	degrees
44	Y CDU data spread (Hi Bus) =	degrees
45	Z CDU data spread (Hi Bus) =	degrees

DATE 30 JUN 66

JOB GYRO COMPASSING | JDC 12222 REV. L PAGE 1 OF 6
INITIAL TDRR 29882 D.S. PGS 12

SUBSYSTEM G & N SYSTEM | ASSY.

DESCRIPTION See below.

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	7-28-66	30311	2, 4	1-6	EA	WS
B	9-1-66	30926	2, 4	-	JP	-
C	11-10-66	31900	2, 4	-	EA	-
D	11-15-66	31949	-	6, 7	EA	-
E	11-15-66	31953	-	1	EA	-
F	12-28-66	32479	All	2, 4, 5, 8	JP	-
G	9-6-67	34560	1	-	EA	-
H	10-12-67	34829	All	-	EA	-
J	11-10-67	35033	All	All	EA	-
K	4-5-68	36041	2, 3	7, 10	EA	-
L	8-5-68	36626	2	-	EA	-

REFERENCES

IMPORTANT

See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the gyrocompassing capabilities of the G and N system. The IMU stable member is coarse aligned to place the X gyro approximately northeast, the Y gyro approximately southeast, and the Z gyro approximately vertical and down. The gyros are then torqued at earth rate for the remainder of the test. After five minutes of Vertical Erect (Major Mode 05), where the outputs of the X and Y PIPA's are used to position the Z gyro closer to vertical, gyrocompassing (Major Mode 02) is automatically initiated. During gyrocompassing the outputs of the X and Y PIPA's are used by the computer to calculate torquing commands to all three gyros in order to hold the stable member in a constant attitude with respect to the earth. The system is gyrocompassed at nominal bus voltage for the first 4 1/2 hours then at low bus voltage for one hour and at high bus

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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voltage for one hour. CDU data is recorded approximately every ten minutes for the duration of the test (about 6 1/2 hours) to evaluate the dynamics of the gyrocompass. At the four hour point the accuracy of the gyrocompass is determined by using the Optical Verification Routine (Major Mode 03).

IMPORTANT: 1. When a specific time is given for performing procedural steps, such times must be adhered to within plus or minus one minute.

2. When time is to be recorded on data sheets, record the time to the nearest minute.

3. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

4. The TRUNNION TPAC on the OUA must indicate between 0 and 5 degrees before the OUA is commanded to zero. Manipulate the Optics Hand Controller on the Indicator Control panel vertically to drive the trunnion axis in a decreasing direction until the TRUNNION TPAC indicates between 0 and 5 degrees. The OPTICS SPEED switch may be adjusted to facilitate positioning the trunnion axis. Do not drive the trunnion axis through zero to the negative limit stop.

5. Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC Test Connector.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization Condition. Insure that G&N Mounting Fixture is tilted to 32.5°.

VOLTAGE SETTING (NOMINAL)

2. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control Panel until DVM indicates 28.8 (±0.5) vdc. Record indication.

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00006 ENTR

---

c. Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of DSKY displays +04500. If display is correct, proceed to step 6; if not, proceed to step 5.

5. Perform the following DSKY operations to change only Row 1:

a. VERB 21 ENTR
b. +04500 ENTR

6. Perform the following DSKY operations:

VERB 33 ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +18000
b. Row 2 +XX.XXX (Test site latitude from Table 1)

If display is correct, proceed to step 9; if not, proceed to step 8.

8. Perform the following DSKY operations:

To change only Row 1--
VERB 21 ENTR
+18000 ENTR

To change only Row 2--
VERB 22 ENTR
+XX.XXX (Test site latitude from Table 1) ENTR

9. Perform the following DSKY operation:

VERB 33 ENTR

Observe PROG lamp changes from 01 after approximately 90 seconds to 05 for approximately 5 minutes, then to 02. Record exact time of day PROG lamp changes to 02, then proceed immediately to step 10.

RECORDING CDU ANGLES

10. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR
b. Record time of ENTR.
c. Record Row 1, Row 2, and Row 3 indications.

Repeat a, b, and c above at ten minute intervals for the remainder of the test. Adhere to the ten minute intervals as closely as possible without interfering with the time requirements of steps 11, 28, and 29.

TEST RESULTS AT FOUR HOURS

NOTE: Perform step 11 four hours after the time recorded in step 9. Complete steps 11 through 27 as rapidly as possible. Recommended time for completion of these steps is three minutes.

11. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

12. Perform the following DSKY

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operation:

VERB 52 ENTR

Observe PROG lamp changes to 03.

13. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +18000
b. Row 2 +00000

If display is correct, proceed to step 15; if not, proceed to step 14.

14. Perform the following DSKY operations to change Row 1 and Row 2:

a. VERB 24 ENTR
b. +18000 ENTR
c. +00000 ENTR

15. Perform the following DSKY operation:

VERB 33 ENTR

16. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +13500
b. Row 2 +00000

If display is correct proceed to step 18; if not, proceed to step 17.

17. Perform the following DSKY operations to change Row 1 and Row 2:

a. VERB 24 ENTR
b. +13500 ENTR
c. +00000 ENTR

18. Perform the following DSKY operation:

VERB 33 ENTR

19. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF. Set OPTICS MODE switch to MAN, and set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive optics until Shaft and Trunnion counters on TPAC indicate 180.0° and 32.5° respectively.

20. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive optics until SXT reticle pattern is centered on target #1 pattern. Press MARK pushbutton. If MARK was satisfactory, proceed to next step; if not, press MARK REJECT and repeat this step.

21. Set the OPTICS SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

22. Set OPTICS SPEED switch to LO. Using Optics Hand Controller drive optics until SXT reticle pattern is centered on target #4 pattern. Press MARK pushbutton.

23. If MARK was satisfactory in previous step, press ENTR pushbutton on DSKY and proceed to next step; if not, press MARK REJECT pushbutton on Indicator Control panel and repeat step 22 and this step.

X, Y, Z GYRO ERRORS

24. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

25. Perform the following DSKY operation:

VERB 34 ENTR

Observe the PROG lamp changes to 02.

26. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

27. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

NOTE: Perform step 28 4-1/2 hours after the time recorded in step 9.

28. Set CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 25.8 (+0.25, -0 vdc). Record indication and time.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

NOTE: Perform step 29 5-1/2 hours after the time recorded in step 9.

29. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 31.8 (+0, -0.25 vdc). Record indication and time.

TEST TERMINATION

NOTE: Perform step 30 6-1/2 hours after the time recorded in step 9.

30. Perform the following DSKY operation:

VERB 36 ENTR

31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc.

CALCULATIONS

32. Record most recent values of BD_X, BD_Y, BD_Z, $ADIA_Z$ $ADSRA_Y$, A_{B_X}, and A_{B_Y} from JDC 12217 in CALCULATIONS portion of data sheets.

33. Calculate and record leveling error contributed by A_{B_Y} as θ_X and leveling error contributed by A_{B_X} as θ_Y as follows:

a. $\theta_X = \dfrac{-57.3\ A_{B_Y}}{g}$ degrees

b. $\theta_Y = \dfrac{57.3\ A_{B_X}}{g}$ degrees

where g is local gravity obtained from Table 2.

34. Calculate and record azimuth error contributed by IRIG drift as θ_Z as follows:

$$\theta_Z = \frac{D(vert) \times \dfrac{12.8}{\cos\lambda} + D(east)\ \dfrac{206}{\cos\lambda\ deg}}{3600}$$

where: $D(vert) = BD_Z + ADIA_Z$ meru,
$D(east) = .707(BD_Y + BD_X + ADSRA_Y)$ meru, and $\cos\lambda$ is cosine of test site latitude obtained from Table 1.

35. Calculate and record compensated X and Y leveling errors at four hour point as follows:

a. Compensated X leveling error = Row 1 indication of step 24 - θ_X degrees

---

b. Compensated Y leveling error = Row 2 indication of step 24 - θ_Y degrees

36. Calculate compensated Z azimuth error at four hour point as follows:

Z azimuth error = Row 3 indication of step 24 - θ_Z degrees

37. Calculate maximum data spread of all XCDU (Row 1) data recorded between 2 hours and 4 hours after the time recorded in step 9.

38. Calculate maximum data spread of all YCDU (Row 2) data recorded between 2 hours and 4 hours after the time recorded in step 9.

39. Calculate maximum data spread of all ZCDU (Row 3) data recorded between 2 hours and 4 hours after the time recorded in step 9.

40. Calculate maximum data spread of all XCDU (Row 1) data recorded between the time recorded in step 28 and the time recorded in step 29.

41. Calculate maximum data spread of all YCDU (Row 2) data recorded between the time recorded in step 28 and the time recorded in step 29.

42. Calculate maximum data spread of all ZCDU (Row 3) data recorded between the time recorded in step 28 and the time recorded in step 29.

43. Calculate maximum data spread of all XCDU (Row 1) data recorded after the time recorded in step 29.

44. Calculate maximum data spread of all YCDU (Row 2) data recorded after the time recorded in step 29.

45. Calculate maximum data spread of all ZCDU (Row 3) data recorded after the time recorded in step 29.

46. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development Div.
Mail Station #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts. 01242

Table 1

Latitude of Test Site		
Location	Latitude	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
KSC	28.516	.87868
NAA	33.921	.82986

Table 2

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 12

JDC
NO. 12222
REV L
INITIAL TDRR 29882

JOB GYRO COMPASSING

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ ____ CAL DATE
NAME ____ SER. NO. ____ ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2	IMU Operate bus	Volts dc	28.3		29.3		
9	Time	▨	▨	___hrs ___ min	▨		
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 12

JDC
NO. 12222
REV L

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		
10	Time	▨	▨	___hrs ___ min	▨		
	Row 1 (X CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 2 (Y CDU)	degrees	▨	( ) ___ . ___	▨		
	Row 3 (Z CDU)	degrees	▨	( ) ___ . ___	▨		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 12

JDC NO. 12212
REV I

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.___	▨		
10	Time	▨	▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.___	▨		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 12

JDC NO. 12212
REV L

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		
10	Time	▨	▨	__hrs__ min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.__	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.__	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.__	▨		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 **OF** 12

JDC NO. 12212
REV I

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		
10	Time	▨		__hrs__ min	▨		
	Row 1 (X CDU)	degrees		( )___.__	▨		
	Row 2 (Y CDU)	degrees		( )___.__	▨		
	Row 3 (Z CDU)	degrees		( )___.__	▨		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 **OF** 12

JDC NO. 12212
REV L

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		

DATE 30 JUN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 12

JDC
NO. 12222
REV. L

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time		▨	__ __ hrs __ __ min	▨		
	Row 1 (X CDU)	degrees	▨	( )__ __ __ . __ __	▨		
	Row 2 (Y CDU)	degrees	▨	( )__ __ __ . __ __	▨		
	Row 3 (Z CDU)	degrees	▨	( )__ __ __ . __ __	▨		
24	Row 1 (X leveling error)	degrees	▨	( )__ __ . __ __ __	▨		
	Row 2 (Y leveling error)	degrees	▨	( )__ __ . __ __ __	▨		
	Row 3 (Z azimuth error)	degrees	▨	( )__ __ . __ __ __	▨		
28	IMU Operate bus	Volts dc	▨		▨		
	Time		▨	__ __ hrs __ __ min	▨		
29	IMU Operate bus	Volts dc	▨		▨		
	Time		▨	__ __ hrs __ __ min	▨		
33.a	θ_X leveling error	degrees	▨		▨		
33.b	θ_Y leveling error	degrees	▨		▨		
34	θ_Z azimuth error	degrees	▨		▨		
35.a	Compensated X leveling error (4 Hours)	degrees	-0.045		+0.045		
35.b	Compensated Y leveling error (4 Hours)	degrees	-0.045		+0.045		
36	Compensated Z Azimuth error (4 Hours)	degrees	-0.573		+0.573		

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EQUIPMENT TEST
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JDC
NO. 12222
REV. K

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
37	X CDU data spread (Nominal Bus)	degrees	▨		0.12		
38	Y CDU data spread (Nominal Bus)	degrees	▨		0.06		
39	Z CDU data spread (Nominal Bus)	degrees	▨		0.06		
40	X CDU data spread (Lo Bus)	degrees	▨		0.30		
41	Y CDU data spread (Lo Bus)	degrees	▨		0.09		
42	Z CDU data spread (Lo Bus)	degrees	▨		0.09		
43	X CDU data spread (Hi Bus)	degrees	▨		0.60		
44	Y CDU data spread (Hi Bus)	degrees	▨		0.18		
45	Z CDU data spread (Hi Bus)	degrees	▨		0.18		

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JDC
NO. 12222
REV. L

JOB GYRO COMPASSING

JDC ITEM NO.	CALCULATIONS
33	BD_X ( ) ____________ meru BD_Y ( ) ____________ meru BD_Z ( ) ____________ meru $ADIA_Z$ ( ) ____________ meru/g $ADSRA_Y$ ( ) ____________ meru/g A_{B_X} ( ) ____________ cm/sec^2 A_{B_Y} ( ) ____________ cm/sec^2
33.a	$\theta_X = \frac{-57.3\ A_{B_Y}}{g}$ degrees $\theta_X =$
33.b	$\theta_Y = \frac{57.3\ A_{B_X}}{g}$ degrees $\theta_Y =$

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JDC
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JOB GYRO COMPASSING

JDC ITEM NO.	CALCULATIONS
34	D(vert) = $BD_Z + ADIA_Z$ meru D(vert) =
	D(east) = .707 ($BD_Y + BD_X + ADSRA_Y$) meru D(east) =
	$\theta_Z = \frac{D(vert) \times \left(\frac{12.8}{\cos\lambda}\right) + D(east) \times \left(\frac{206}{\cos\lambda}\right)}{3600}$ degrees $\theta_Z =$

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JOB GYRO COMPASSING

JDC ITEM NO.	CALCULATIONS
35.a	X leveling error = Step 24 (Row 1) - θ_X degrees X leveling error =
35.b	Y leveling error = Step 24 (Row 2) - θ_Y degrees Y leveling error =
36	Z azimuth error = Step 24 (Row 3) - θ_Z degrees Z azimuth error =
37	X CDU data spread (Nominal Bus) = degrees

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JDC
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JOB GYRO COMPASSING

JDC ITEM NO.	CALCULATIONS
38	Y CDU data spread (Nominal Bus) = degrees
39	Z CDU data spread (Nominal Bus) = degrees
40	X CDU data spread (Lo Bus) = degrees
41	Y CDU data spread (Lo Bus) = degrees
42	Z CDU data spread (Lo Bus) = degrees
43	X CDU data spread (Hi Bus) = degrees
44	Y CDU data spread (Hi Bus) = degrees
45	Z CDU data spread (Hi Bus) = degrees

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JOB GYRO COMPASSING

JDC 12222 REV. M PAGE 1 OF 7

INITIAL TDRR 29882 D.S. PGS 12

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	7-28-66	30311	2,4	1-6	EA	WS	
B	9-1-66	30926	2,4	-	JP	-	
C	11-10-66	31900	2,4	-	EA	-	IMPORTANT
D	11-15-66	31949	-	6,7	EA	-	See below.
E	11-15-66	31953	-	1	EA	-	
F	12-28-66	32479	All	2,4,5,8	JP	-	INTERVAL
G	9-6-67	34560	1	-	EA	-	
H	10-12-67	34829	All	-	EA	-	TOOLS AND MATERIAL
J	11-10-67	35033	All	All	EA	-	
K	4-5-68	36041	2,3	7,10	EA	-	
L	8-5-68	36626	2	-	EA	-	
M	5-26-70	38133	2, 5	-	EA	-	

DESCRIPTION: This procedure tests the gyrocompassing capabilities of the G and N system. The IMU stable member is coarse aligned to place the X gyro approximately northeast, the Y gyro approximately southeast, and the Z gyro approximately vertical and down. The gyros are then torqued at earth rate for the remainder of the test. After five minutes of Vertical Erect (Major Mode 05), where the outputs of the X and Y PIPA's are used to position the Z gyro closer to vertical, gyrocompassing (Major Mode 02) is automatically initiated. During gyrocompassing the outputs of the X and Y PIPA's are used by the computer to calculate torquing commands to all three gyros in order to hold the stable member in a constant attitude with respect to the earth. The system is gyrocompassed at nominal bus voltage for the first 4 1/2 hours then at low bus voltage for one hour and at high bus

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM 01-2A
Chg. 3-18-66

JOB GYRO COMPASSING

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SUBSYSTEM G & N SYSTEM

ASSY

voltage for one hour. CDU data is recorded approximately every ten minutes for the duration of the test (about 6 1/2 hours) to evaluate the dynamics of the gyrocompass. At the four hour point the accuracy of the gyrocompass is determined by using the Optical Verification Routine (Major Mode 03).

IMPORTANT: 1. When a specific time is given for performing procedural steps, such times must be adhered to within plus or minus one minute.

2. When time is to be recorded on data sheets, record the time to the nearest minute.

3. Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

4. The TRUNNION TPAC on the OUA must indicate between 0 and 5 degrees before the OUA is commanded to zero. Manipulate the Optics Hand Controller on the Indicator Control panel vertically to drive the trunnion axis in a decreasing direction until the TRUNNION TPAC indicates between 0 and 5 degrees. The OPTICS SPEED switch may be adjusted to facilitate positioning the trunnion axis. Do not drive the trunnion axis through zero to the negative limit stop.

5. Insure that cable W226 is removed and connector assembly (2003099) or Restart Monitor module (2898989) is connected to CGC Test Connector.

INITIALIZATION

1. Perform JDC 12215 to establish a Master Initialization Condition. Insure that G&N Mounting Fixture is tilted to 32.5°.

VOLTAGE SETTING (NOMINAL)

2. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control Panel until DVM indicates 28.8 (±0.5) vdc. Record indication.

TEST ENTRY

3. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00006 ENTR

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JOB GYRO COMPASSING

JDC 12222 REV M PAGE 3 OF 7

SUBSYSTEM G&N SYSTEM

ASSY

c. Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of DSKY displays +04500. If display is correct, proceed to step 6; if not, proceed to step 5.

5. Perform the following DSKY operations to change only Row 1:

a. VERB 21 ENTR

b. +04500 ENTR

6. Perform the following DSKY operations:

VERB 33 ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +18000

b. Row 2 +XX.XXX (Test site latitude from Table 1)

If display is correct, proceed to step 9; if not, proceed to step 8.

8. Perform the following DSKY operations:

To change only Row 1--

VERB 21 ENTR

+18000 ENTR

To change only Row 2--

VERB 22 ENTR

+XX.XXX (Test site latitude from Table 1) ENTR

9. Perform the following DSKY operation:

VERB 33 ENTR

Observe PROG lamp changes from 01 after approximately 90 seconds to 05 for approximately 5 minutes, then to 02. Record exact time of day PROG lamp changes to 02, then proceed immediately to step 10.

RECORDING CDU ANGLES

10. Perform the following DSKY operations:

a. VERB 06 NOUN 20 ENTR

b. Record time of ENTR.

c. Record Row 1, Row 2, and Row 3 indications.

Repeat a, b, and c above at ten minute intervals for the remainder of the test. Adhere to the ten minute intervals as closely as possible without interfering with the time requirements of steps 11, 28, and 29.

TEST RESULTS AT FOUR HOURS

NOTE: Perform step 11 four hours after the time recorded in step 9. Complete steps 11 through 27 as rapidly as possible. Recommended time for completion of these steps is three minutes.

11. Press to light OPTICS POWER ON pushbutton on Test Control panel. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

12. Perform the following DSKY

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SUBSYSTEM G&N SYSTEM

ASSY

operation:

VERB 52 ENTR

Observe PROG lamp changes to 03.

13. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +18000

b. Row 2 +00000

If display is correct, proceed to step 15; if not, proceed to step 14.

14. Perform the following DSKY operations to change Row 1 and Row 2:

a. VERB 24 ENTR

b. +18000 ENTR

c. +00000 ENTR

15. Perform the following DSKY operation:

VERB 33 ENTR

16. When VERB 06 and NOUN 61 commence flashing, insure that DSKY displays the following:

a. Row 1 +13500

b. Row 2 +00000

If display is correct proceed to step 18; if not, proceed to step 17.

17. Perform the following DSKY operations to change Row 1 and Row 2:

a. VERB 24 ENTR

b. +13500 ENTR

c. +00000 ENTR

18. Perform the following DSKY operation:

VERB 33 ENTR

19. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF. Set OPTICS MODE switch to MAN, and set OPTICS SPEED switch to HI. Using Optics Hand Controller, drive optics until Shaft and Trunnion counters on TPAC indicate 180.0° and 32.5° respectively.

20. Set OPTICS SPEED switch to LO. Using Optics Hand Controller, drive optics until SXT reticle pattern is centered on target #1 pattern. Press MARK pushbutton. If MARK was satisfactory, proceed to next step; if not, press MARK REJECT and repeat this step.

21. Set the OPTICS SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

22. Set OPTICS SPEED switch to LO. Using Optics Hand Controller drive optics until SXT reticle pattern is centered on target #4 pattern. Press MARK pushbutton.

23. If MARK was satisfactory in previous step, press ENTR pushbutton on DSKY and proceed to next step; if not, press MARK REJECT pushbutton on Indicator Control panel and repeat step 22 and this step.

X, Y, Z GYRO ERRORS

24. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

25. Perform the following DSKY operation:

VERB 34 ENTR

Observe the PROG lamp changes to 02.

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26. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

27. Press to extinguish OPTICS POWER ON pushbutton on Test Control panel.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

NOTE: Perform step 28 4-1/2 hours after the time recorded in step 9.

28. Set CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 25.8 (+0.25, -0 vdc). Record indication and time.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

NOTE: Perform step 29 5-1/2 hours after the time recorded in step 9.

29. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 31.8 (+0, -0.25 vdc). Record indication and time.

TEST TERMINATION

NOTE: Perform step 30 6-1/2 hours after the time recorded in step 9.

30. Perform the following DSKY operation:

VERB 36 ENTR

31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.5) vdc.

NOTE: Step 31A applies only when Restart Monitor module (2898989) is installed.

31A. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00077 ENTR

c. The contents of Row 1 shall be 00000.

CALCULATIONS

32. Record most recent values of BD_X, BD_Y, BD_Z, $ADIA_Z$ $ADSRA_Y$, A_{B_X}, and A_{B_Y} from JDC 12217 in CALCULATIONS portion of data sheets.

33. Calculate and record leveling error contributed by A_{B_Y} as θ_X and leveling error contributed by A_{B_X} as θ_Y as follows:

a. $\theta_X = \dfrac{-57.3\ A_{B_Y}}{g}$ degrees

b. $\theta_Y = \dfrac{57.3\ A_{B_X}}{g}$ degrees

where g is local gravity obtained from Table 2.

---

34. Calculate and record azimuth error contributed by IRIG drift as θ_Z as follows:

$$\theta_Z = \frac{D(vert) \times \dfrac{12.8}{\cos\lambda} + D(east)\ \dfrac{206}{\cos\lambda}\ deg}{3600}$$

where: $D(vert) = BD_Z + ADIA_Z$ meru,
$D(east) = .707(BD_Y + BD_X + ADSRA_Y)$ meru, and cos λ is cosine of test site latitude obtained from Table 1.

35. Calculate and record compensated X and Y leveling errors at four hour point as follows:

a. Compensated X leveling error = Row 1 indication of step 24 - θ_X degrees

b. Compensated Y leveling error = Row 2 indication of step 24 - θ_Y degrees

36. Calculate compensated Z azimuth error at four hour point as follows:

Z azimuth error = Row 3 indication of step 24 - θ_Z degrees

37. Calculate maximum data spread of all XCDU (Row 1) data recorded between 2 hours and 4 hours after the time recorded in step 9.

38. Calculate maximum data spread of all YCDU (Row 2) data recorded between 2 hours and 4 hours after the time recorded in step 9.

39. Calculate maximum data spread of all ZCDU (Row 3) data recorded between 2 hours and 4 hours after the time recorded in step 9.

40. Calculate maximum data spread of all XCDU (Row 1) data recorded between the time recorded in step 28 and the time recorded in step 29.

41. Calculate maximum data spread of all YCDU (Row 2) data recorded between the time recorded in step 28 and the time recorded in step 29.

42. Calculate maximum data spread of all ZCDU (Row 3) data recorded between the time recorded in step 28 and the time recorded in step 29.

43. Calculate maximum data spread of all XCDU (Row 1) data recorded after the time recorded in step 29.

44. Calculate maximum data spread of all YCDU (Row 2) data recorded after the time recorded in step 29.

45. Calculate maximum data spread of all ZCDU (Row 3) data recorded after the time recorded in step 29.

46. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development Div.
Mail Station #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts. 01242

Table 1

Latitude of Test Site

Location	Latitude	Cos λ
MIT	42.361	.73885
AC	42.902	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
KSC	28.516	.87868
NAA	33.921	.82985

Table 2

Location	Gravity
MIT	980.40
AC	980.32
GAEC	980.26
MSC	979.29
MILA	979.24
NAA	979.56

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 12

NO. 12222 JDC
REV M
INITIAL TDRR 29882

JOB GYRO COMPASSING

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ ______ CAL DATE
NAME ______ SER. NO. ______ ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2	IMU Operate bus	Volts dc	28.3		29.3		
9	Time	▨	▨	__hrs __ __ min	▨		
10	Time	▨	▨	__hrs __ __ min	▨		
	Row 1 (X CDU)	degrees	▨	( )__ __ __ . __ __	▨		
	Row 2 (Y CDU)	degrees	▨	( )__ __ __ . __ __	▨		
	Row 3 (Z CDU)	degrees	▨	( )__ __ __ . __ __	▨		
10	Time	▨	▨	__hrs __ __ min	▨		
	Row 1 (X CDU)	degrees	▨	( )__ __ __ . __ __	▨		
	Row 2 (Y CDU)	degrees	▨	( )__ __ __ . __ __	▨		
	Row 3 (Z CDU)	degrees	▨	( )__ __ __ . __ __	▨		
10	Time	▨	▨	__hrs __ __ min	▨		
	Row 1 (X CDU)	degrees	▨	( )__ __ __ . __ __	▨		
	Row 2 (Y CDU)	degrees	▨	( )__ __ __ . __ __	▨		
	Row 3 (Z CDU)	degrees	▨	( )__ __ __ . __ __	▨		
10	Time	▨	▨	__hrs __ __ min	▨		
	Row 1 (X CDU)	degrees	▨	( )__ __ __ . __ __	▨		
	Row 2 (Y CDU)	degrees	▨	( )__ __ __ . __ __	▨		
	Row 3 (Z CDU)	degrees	▨	( )__ __ __ . __ __	▨		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 12

JDC
NO. 12222
REV. M

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			

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DATA SHEET 3 **OF** 12

JDC
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REV. M

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			

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JDC
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JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			

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JDC
NO. 12222
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JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			
10	Time			__hrs__min			
	Row 1 (X CDU)	degrees		( )___.__			
	Row 2 (Y CDU)	degrees		( )___.__			
	Row 3 (Z CDU)	degrees		( )___.__			

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REV. M

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		
10	Time	▨		___hrs___min	▨		
	Row 1 (X CDU)	degrees		( )___.___	▨		
	Row 2 (Y CDU)	degrees		( )___.___	▨		
	Row 3 (Z CDU)	degrees		( )___.___	▨		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 12

JDC
NO. 12222
REV. M

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Time		▨	___hrs___min	▨		
	Row 1 (X CDU)	degrees	▨	( )___.___	▨		
	Row 2 (Y CDU)	degrees	▨	( )___.___	▨		
	Row 3 (Z CDU)	degrees	▨	( )___.___	▨		
24	Row 1 (X leveling error)	degrees	▨	( )___.___	▨		
	Row 2 (Y leveling error)	degrees	▨	( )___.___	▨		
	Row 3 (Z azimuth error)	degrees	▨	( )___.___	▨		
28	IMU Operate bus	Volts dc	▨		▨		
	Time		▨	___hrs___min	▨		
29	IMU Operate bus	Volts dc	▨		▨		
	Time		▨	___hrs___min	▨		
33.a	θ_X leveling error	degrees	▨		▨		
33.b	θ_Y leveling error	degrees	▨		▨		
34	θ_Z azimuth error	degrees	▨		▨		
35.a	Compensated X leveling error (4 Hours)	degrees	-0.045		+0.045		
35.b	Compensated Y leveling error (4 Hours)	degrees	-0.045		+0.045		
36	Compensated Z Azimuth error (4 Hours)	degrees	-0.573		+0.573		

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EQUIPMENT TEST
DATA SHEET 8 **OF** 12

JDC
NO. 12222
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JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
37	X CDU data spread (Nominal Bus)	degrees	▨		0.12		
38	Y CDU data spread (Nominal Bus)	degrees	▨		0.06		
39	Z CDU data spread (Nominal Bus)	degrees	▨		0.06		
40	X CDU data spread (Lo Bus)	degrees	▨		0.30		
41	Y CDU data spread (Lo Bus)	degrees	▨		0.09		
42	Z CDU data spread (Lo Bus)	degrees	▨		0.09		
43	X CDU data spread (Hi Bus)	degrees	▨		0.60		
44	Y CDU data spread (Hi Bus)	degrees	▨		0.18		
45	Z CDU data spread (Hi Bus)	degrees	▨		0.18		

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EQUIPMENT TEST
DATA SHEET 9 **OF** 12

JDC
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JOB GYRO COMPASSING

JDC ITEM NO.	CALCULATIONS
32	BD_X ( ) ________ meru BD_Y ( ) ________ meru BD_Z ( ) ________ meru $ADIA_Z$ ( ) ________ meru/g $ADSRA_Y$ ( ) ________ meru/g A_{B_X} ( ) ________ cm/sec^2 A_{B_Y} ( ) ________ cm/sec^2
33.a	$\theta_X = \frac{-57.3\ A_{B_Y}}{g}$ degrees $\theta_X =$
33.b	$\theta_Y = \frac{57.3\ A_{B_X}}{g}$ degrees $\theta_Y =$

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DATA SHEET 10 OF 12

JDC
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JOB GYRO COMPASSING

JDC ITEM NO.	CALCULATIONS
34	$D(vert) = BD_Z + ADIA_Z$ meru $D(vert) =$
	$D(east) = .707\,(BD_Y + BD_X + ADSRA_Y)$ meru $D(east) =$
	$\theta_Z = \dfrac{D(vert) \times \left(\dfrac{12.8}{\cos\lambda}\right) + D(east) \times \left(\dfrac{206}{\cos\lambda}\right)}{3600}$ degrees $\theta_Z =$

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EQUIPMENT TEST
DATA SHEET 11 OF 12

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JOB GYRO COMPASSING

JDC ITEM NO.	CALCULATIONS
35.a	X leveling error = Step 24 (Row 1) - θ_X degrees X leveling error =
35.b	Y leveling error = Step 24 (Row 2) - θ_Y degrees Y leveling error =
36	Z azimuth error = Step 24 (Row 3) - θ_Z degrees Z azimuth error =
37	X CDU data spread (Nominal Bus) = degrees

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 12 OF 12

JDC
NO. 12222
REV. M

JOB GYRO COMPASSING

JDC ITEM NO.	CALCULATIONS
38	Y CDU data spread (Nominal Bus) = degrees
39	Z CDU data spread (Nominal Bus) = degrees
40	X CDU data spread (Lo Bus) = degrees
41	Y CDU data spread (Lo Bus) = degrees
42	Z CDU data spread (Lo Bus) = degrees
43	X CDU data spread (Hi Bus) = degrees
44	Y CDU data spread (Hi Bus) = degrees
45	Z CDU data spread (Hi Bus) = degrees

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JOB GYRO COMPASSING

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INITIAL TDRR 29882 D.S. PGS 8

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION See below.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		
			JDC	D.S.	MIT	NASA	REFERENCES
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

DESCRIPTION: This procedure tests the Gyro Compassing capabilities of the G & N System. The test is is computer controlled. The system is erected with the X Gyro Northeast, the Y Gyro Southeast, and the Z Gyro down. The output of the X and Y PIPA's is used to hold the platform vertical. The Y PIPA and X Gyro comprise the compassing loop. The X and Y gyro elevation errors and the Z gyro azimuth error are checked after a two hour settling period and every 15 minutes thereafter for a period of 3 hours, using optical verification. The test takes approximately 5 hours to perform. From the third to the fourth hour, the prime power is set to the LO limit. From the fourth to the fifth hour the prime power is set to the HI limit.

INITIALIZATION

1. Establish a Master Initialization Condition.

VOLTAGE SETTING (NOMINAL)

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

---

the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record the indication.

TEST ENTRY

3. Perform the following DSKY operations:

VERB 57	ENTR
00006	ENTR

Observe the PROG lamp changes to 01.

4. When VERB 06 and NOUN 61 commence flashing, insure that Row 1 of the DSKY displays +04500. If the display is correct proceed to step 6, if not proceed to step 5.

5. Perform the following DSKY operations:

To change only Row 1:

VERB 21	ENTR
+04500	ENTR

6. Perform the following DSKY operation:

VERB 33	ENTR

7. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays	+18000
Row 2 displays	+XX.XXX (Test site latitude from Table 1)

If the display is correct proceed to step 9 if not proceed to step 8

8. Perform the following DSKY operations.

To change only Row 1:

VERB 21	ENTR
+18000	ENTR

To change only Row 2

VERB 22	ENTR
+XX.XXX (Test site latitude from Table 1)	ENTR

9. Perform the following DSKY operations:

VERB 33	ENTR

Observe the PROG lamp changes to 01 for approximately 90 seconds then to 05 for approximately 15 minutes, then to 02 for the duration of this test.

TEST RESULTS AT 2 HRS

10. After 120 minutes have elapsed since initiation of step 9, set the OPTICS MODE switch on the Indicator Control panel to ZERO.

11. Perform the following DSKY operations:

Enter VERB 52	ENTR

Observe the PROG lamp changes to 03.

TARGET #1 AZ AND ELEV

12. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +18000
Row 2 displays +00000

If the display is correct proceed to step 14, if not, proceed to step 13.

13. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24	ENTR
+18000	ENTR
+00000	ENTR

14. Perform the following DSKY operation:

VERB 33	ENTR

TARGET #4 AZ AND ELEV

15. When VERB 06 and NOUN 61 commence flashing, insure that the DSKY displays the following:

Row 1 displays +13500
Row 2 displays +00000

DATE ________

If display is correct proceed to step 17 if not, proceed to step 16

16. Perform the following DSKY operations. To change Row 1 and Row 2:

VERB 24	ENTR
+13500	ENTR
+00000	ENTR

17. Perform the following DSKY operations:

VERB 33	ENTR

MARK ON TARGET #1

18. Set the OPTICS MODE switch on the Indicator Control panel to MAN and the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 180.0° and 32.5° respectively.

19. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #1. Press the MARK pushbutton. If MARK was satisfactory, proceed to the next step, if not press MARK REJECT and repeat this step.

MARK ON TARGET #4

20. Set the CONTROLLER SPEED switch to HI. Using the Optics Hand Controller, drive the optics until the Shaft and Trunnion counters on the TPAC indicate 241.0° and 53° respectively.

21. Set the CONTROLLER SPEED switch to LO. Using the Optics Hand Controller, drive the optics until the SXT central horizontal reticle line is centered on the horizontal reticle line and dot of target #4. Press the MARK pushbutton. If MARK was satisfactory, press ENTR and proceed to the next step, if not, press MARK REJECT and repeat this step.

X, Y, Z GYRO ERRORS

22. Observe VERB 06 and NOUN 60 are displayed. Record Row 1, Row 2, and Row 3 indications.

23. Perform the following DSKY operations:

VERB 34	ENTR

Observe the PROG lamp changes to 02. Set the OPTICS MODE switch to ZERO.

24. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (LO BUS)

25. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 25.8 (+0.25, -0 vdc). Record the indication.

26. Repeat step 11 through 23 for the next hour at 15 minute intervals.

GYRO COMPASSING, VOLTAGE MARGIN (HI BUS)

27. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 31.8 (+0, -0.25 vdc). Record the indication.

28. Repeat steps 11 through 23 for the next hour at 15 minute intervals.

DATE ________

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29. Perform the following DSKY operations:

VERB 36	ENTR

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28 (±.25 vdc).

31. Perform the calculations on the calculation sheet and complete the data sheets.

32. Upon completion of data sheets, make a copy of data sheets and forward immediately to:

Inertial Subsystem Development
DIV #63
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02042

Table 1

Latitude of Test Site		
Location	Latitude λ	Cos λ
MIT	42.361	.73885
AC	42.900	.73254
GAEC	40.748	.75756
MSC	29.556	.86993
MILA	28.516	.82868
NAA	33.917	.82985

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8

JDC
NO. 12222
REV. -
INITIAL TDRR 29882

JOB GYRO COMPASSING

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
2	IMU OPERATE BUS, 28VDC	volts dc	28.0		28.25			a
22	X Gyro elevation error Row 1 (+2 HRS)	degrees	-.03		+.03			b
	Y Gyro elevation error Row 2 (+2 HRS)	degrees	-.03		+.03			c
	Z Gyro azimuth error Row 3	degrees	▨		▨			d
24 (15 min)	X Gyro elevation error Row 1	degrees	▨		▨			e
	Y Gyro elevation error Row 2	degrees	▨		▨			f

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 8

JDC
NO. 12222
REV. -

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Z Gyro azimuth error Row 3	degrees	▨		▨			g
24 (30 min)	X Gyro elevation error Row 1	degrees	▨		▨			h
	Y Gyro elevation error Row 2	degrees	▨		▨			i
	Z Gyro azimuth error Row 3	degrees	▨		▨			j
24 (45 min)	X Gyro elevation error Row 1	degrees	▨		▨			k
	Y Gyro elevation error Row 2	degrees	▨		▨			l
	Z Gyro azimuth error Row 3	degrees	▨		▨			m
24 (60 min)	X Gyro elevation error Row 2 (+3 HRS)	degrees	▨		▨			n

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 8

JDC
NO. 12222
REV. -

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2 (+3 HRS)	degrees	▨		▨			o
	Z Gyro azimuth error Row 3 (+3 HRS)	degrees	▨		▨			p
25	IMU OPERATE BUS 28 VDC	volts dc	25.8		26.05			q
26 (15 min)	X Gyro elevation error Row 1	degrees	▨		▨			r
	Y Gyro elevation error Row 2	degrees	▨		▨			s
	Z Gyro azimuth error Row 3	degrees	▨		▨			t
26 (30 min)	X Gyro elevation error Row 1	degrees	▨		▨			u
	Y Gyro elevation error Row 2	degrees	▨		▨			v
	Z Gyro azimuth error Row 3	degrees	▨		▨			w

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 8

JDC
NO. 12222
REV. -

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
26 (45 min)	X Gyro elevation error Row 1	degrees	▨		▨			x
	Y Gyro elevation error Row 2	degrees	▨		▨			y
	Z Gyro azimuth error Row 3	degrees	▨		▨			z
26 (60 min)	X Gyro elevation error Row 1	degrees	▨		▨			aa
	Y Gyro elevation error Row 2	degrees	▨		▨			ab
	Z Gyro azimuth error Row 3	degrees	▨		▨			ac
27	IMU OPERATE BUS 28 VDC	volts dc	31.55		31.8			ad
28 (15 min)	X Gyro elevation error Row 2	degrees	▨		▨			ae

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12222
REV. -

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
	Y Gyro elevation error Row 2	degrees	▨		▨			af
	Z Gyro azimuth error Row 3	degrees	▨		▨			ag
28 (30 min)	X Gyro elevation error Row 2	degrees	▨		▨			ah
	Y Gyro elevation error Row 2	degrees	▨		▨			ai
	Z Gyro azimuth error Row 3	degrees	▨		▨			aj
28 (45 min)	X Gyro elevation error Row 1	degrees	▨		▨			ak
	Y Gyro elevation error Row 2	degrees	▨		▨			al
	Z Gyro azimuth error Row 3	degrees	▨		▨			am

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
NO. 12222
REV. -

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
28 (60 min)	X Gyro elevation error Row 1	degrees	▨		▨			an
	Y Gyro elevation error Row 2	degrees	▨		▨			ao
	Z Gyro azimuth error Row 3	degrees	▨		▨			ap
31	Azimuth error contributed by IRIG coefficients	degrees	▨		▨			aq
31a	Z Gyro azimuth error (corrected) +2 HRS	degrees	-.57		+.57			ar
31b	ΔX Gyro elevation error +3 HRS	degrees	-.02		+.02			as
31c	ΔY Gyro elevation error +3 HRS	degrees	-.02		+.02			at
31d	ΔZ Gyro azimuth error +3 HRS	degrees	-.06		+.06			au
31e	ΔX Gyro elevation error +4 HRS (LO BUS)	degrees	-.02		+.02			av

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 8

JDC
NO. 12222
REV. -

JOB GYRO COMPASSING

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
31f	ΔY Gyro elevation error +4 HRS (LO BUS)	degrees	-.02		+.02			aw
31g	ΔZ Gyro azimuth error +4 HRS (LO BUS)	degrees	-.06		+.06			ax
31h	ΔX Gyro elevation error +5 HRS (HI BUS)		▨		▨			ay
31i	ΔY Gyro elevation error +5 HRS (HI BUS)		▨		▨			az
31j	ΔZ Gyro azimuth error +5 HRS (HI BUS)		▨		▨			ba

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 8

JDC
NO. 12222
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JOB GYRO COMPASSING

CALCULATIONS SHEET

Record the latest values of the following coefficients from JDC 12217.

NBDX ( ) ____________
NBDY ( ) ____________
NBDZ ( ) ____________
ADIAZ ( ) ____________
ADSRAY ( ) ____________

Perform the following calculations. Cos λ functions are provided in table 1.

Drift (vert) = NBDZ + ADIAZ
Drift (vert) = ( ) ____________ meru
Drift (east) = .707(NBDY + NBDX + ADSRAY)
Drift (east) = ( ) ____________ meru

IRIG COEFFICIENT AZ ERROR CONTRIBUTION

$$\phi\,(\text{vert}) = \frac{D(\text{vert}) \times \frac{24.2}{\cos\lambda} + D(\text{east}) \times \frac{206}{\cos\lambda}}{3600}$$

ϕ (vert) = ( ) ____________ degrees

Record answer on line aq.

Perform the following calculations

a.	line d - line aq	record on line ar
b.	line b - line n	record on line as
c.	line c - line o	record on line at
d.	line d - line p	record on line au
e.	line b - line aa	record on line av
f.	line c - line ab	record on line aw
g.	line d - line ac	record on line ax
h.	line b - line an	record on line ay
i.	line c - line ao	record on line az
j.	line d - line ap	record on line ba

DATE ________

JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS | JDC 12223 REV. - PAGE 1 OF 10
INITIAL TDRR 29882 D.S. PGS 12
SUBSYSTEM G&N SYSTEM | ASSY.

DESCRIPTION Procedures for alignment of optical targets prior to G&N system tes ing. Initial alignment and periodic alignment procedures are provided.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL See below.

IMPORTANT: To prevent the introduction of errors by bumping of the theodolite or tripod, or by movement of the theodolite during adjustment, alignment of both the plate and collimation levels should be checked immediately before each reading.

TOOLS AND MATERIAL:
1) 0° autocollimator assembly, part number 1017380
2) 45° autocollimator assembly, part number 1017381
3) Theodolite and support assembly, part number 1017447 or Theodolite 1017444 with suitable mounting base
4) Alignment reference device (adjustable mirror, part number 1017377)
5) Sextant alignment bar, (see figure 1)
6) Vertical leveling mirror, part number 1017445

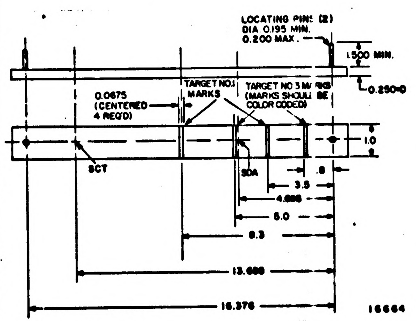
LOCATING PINS (2) DIA 0.195 MIN. 0.200 MAX.
1.500 MIN.
0.250-0
0.0675 (CENTERED 4 REQ'D)
TARGET NO.1 MARKS
TARGET NO 3 MARKS (MARKS SHOULD BE COLOR CODED)
1.0
SCT
SDA
.8
3.5
4.000
5.0
8.3
13.000
16.376
16664

Figure 1. Block II Sextant Alignment Bar

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE

A. PREPARATION

NOTE: Refer to figure 3, throughout this procedure for placement of targets and lines-of-sight. Reference to targets is as follows:

TARGET No. 1 5-inch autocollimator, part number 1017410

TARGET No. 2 2-1/2-inch autocollimator, part number 1017435

TARGET No. 3 2-1/2-inch autocollimator, part number 1017448

TARGET No. 4 2-1/2-inch autocollimator, part number 1017448

NOTE: Initial alignment of the optical targets is accomplished by performing this complete procedure and must be performed prior to testing the first G&N system. Periodic alignment of the optical targets is accomplished by performing steps A.6, A.7, B.3 through B.7, B.16 through B.24, B.33 through B.44, C.1 and C.2. Periodic alignment is required when testing each G&N System as indicated on applicable flowgram.

1. Place the 0° autocollimator assembly on G&N system 0° pier such that the autocollimators are pointing north. Insert and engage the three holding screws and flat washers.

2. Place the 45° autocollimator assembly on G&N system 45° pier such that the autocollimators are pointing north-west. Insert and engage the three holding screws and flat washers.

3. Install sextant alignment bar on the north side of the G&N Mounting Fixture Cradle with the target marks facing the 0° target pier and with Target no. 1 marks to the west. See figure 2.

4. Set the tilt axis of the G&N Mounting Fixture Cradle to 0°.

5. Set the micrometer drums on TARGET Nos. 1, 2, 3, and 4 to 10 minutes 0 seconds. Set the azimuth adjust knobs to mid-range.

6. Record certified azimuth (α) of facility azimuth reference.

7. Position the alignment reference device to the north-west of the 0° target pier and such that the line-of-sight intersects TARGET nos. 1, 2, 3, and 4 lines-of-sight and the azimuth reference line-of-sight.

DATE

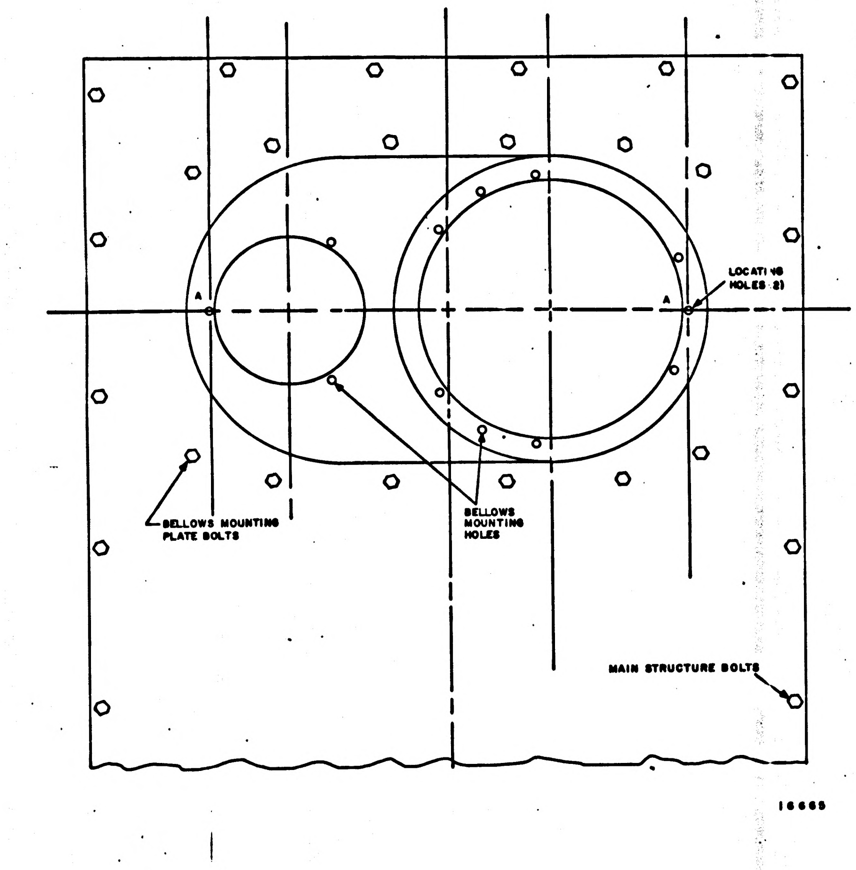

Figure 2. Block II Fixture Back Plate Configuration

DATE

B. PROCEDURE

1. Align the 0° autocollimator assembly laterally by aligning TARGET No. 1 to the sextant alignment bar Target no. 1 scribe marks as follows:

NOTE: Use the eyepiece from TARGET No. 2 as the auxiliary eyepiece.

- a. Hold the auxiliary eyepiece over TARGET No. 1 eyepiece and focus the auxiliary eyepiece on the sextant alignment bar.
- b. Position the 0° autocollimator assembly laterally until the two Target no. 1 scribe marks on the sextant alignment bar are positioned at equal distances from the edges of the autocollimator objective lens as viewed through the auxiliary eyepiece.
- c. Tighten the 0° autocollimator assembly holding screws.

2. Align the 45° autocollimator assembly laterally by aligning TARGET No. 3 to the sextant alignment bar Target no. 3 scribe marks as follows:

- a. Hold the auxiliary eyepiece over TARGET No. 3 eyepiece and focus the auxiliary eyepiece on the sextant alignment bar.
- b. Position the 45° autocollimator assembly laterally until the two Target no. 3 scribe marks on the sextant alignment bar are positioned at equal distances from the edges of the autocollimator objective lens as viewed through the auxiliary eyepiece.
- c. Tighten the 45° autocollimator assembly holding screws.

3. Position the theodolite at the intersection of the lines-of-sight of the azimuth reference device and alignment reference device.

4. Level the theodolite base to the plate spirit level and the theodolite telescope to the altitude level. Adjust the objective focus to infinity.

5. Measure the angle between the azimuth reference device and the alignment reference device lines-of-sight as follows:

- a. Align the theodolite in azimuth to the azimuth reference device. Record the theodolite horizontal scale reading.
- b. Align the theodolite in azimuth to the alignment reference device. Record the theodolite horizontal scale reading.
- c. Calculate and record the angle (β) between the azimuth reference device and alignment reference device lines-of-sight.
- d. Rotate the theodolite telescope 180° on its horizontal axis and then 180° on its vertical axis such that the telescope is inverted and pointed at the alignment reference device.

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e. Align the theodolite in azimuth to the alignment reference device. Record the theodolite horizontal scale reading.

f. Align the theodolite in azimuth to the azimuth reference device. Record the theodolite horizontal scale reading.

g. Calculate and record the angle (β) between the azimuth reference device and alignment reference device lines-of-sight.

h. Rotate the theodolite telescope 180° on its horizontal axis and then 180° on its vertical axis such that the telescope is pointing at the azimuth reference device.

i. Increase the theodolite horizontal circle scale reading by 180°.

6. Repeat step B.5 two times to obtain four measurements of the angle (β) between the azimuth reference device and alignment reference device lines-of-sight. Calculate and record the average ($\bar{\beta}$) of the four measurements.

7. Calculate and record the azimuth (γ) of the alignment reference device using the following formula:

$$\gamma = 180 - (\bar{\beta} - \alpha)$$

where: $\bar{\beta}$ = Angle between azimuth reference and alignment reference device lines-of-sight recorded in step B.6.

α = Azimuth of facility azimuth reference.

8. Position the theodolite at the intersection of the lines-of-sight of TARGET No. 1 and the alignment reference device.

9. Level the theodolite base to the plate spirit level and the theodolite telescope to the altitude level.

10. Align the theodolite in azimuth to the alignment reference device. Record the horizontal scale reading of the theodolite.

11. Rotate the theodolite through the angle recorded in step B.7 toward TARGET No. 1. Record the horizontal scale reading of the theodolite.

12. Align TARGET No. 1 in elevation and azimuth as follows:

a. Level TARGET No. 1 using the vertical leveling mirror.

b. Sighting through TARGET No. 1, adjust the azimuth of TARGET No. 1 until the projected reticle pattern of the theodolite is superimposed on TARGET No. 1 reticle.

c. Repeat a and b as necessary until no further adjustment in elevation and azimuth is required.

13. Remove the theodolite from TARGET No. 1 line-of-sight.

14. Hold the auxiliary eyepiece on TARGET No. 1 standard eyepiece and ascertain that both Target No. 1 scribe marks on the

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sextant alignment bar are within TARGET No. 1 field-of-view as viewed through the auxiliary eyepiece. Repeat steps B.1 and B.8 through B.12, if necessary, until the Target no. 1 scribe marks are within TARGET No. 1 field-of-view after performing step B.12.

15. Scribe a mark on the fixed plate of the 0° target pier in line with the scribe mark on the 0° autocollimator assembly.

16. Position the theodolite at the intersection of the lines-of-sight of TARGET No. 1 and the alignment reference device.

17. Level the theodolite base to the plate spirit level and the theodolite telescope to the altitude level.

18. Measure the angle ($\theta 1$) between the alignment reference device line-of-sight and TARGET No. 1 line-of-sight as follows:

a. Align the theodolite in azimuth to the alignment reference device. Record the theodolite horizontal scale reading.

b. Align the theodolite in azimuth to TARGET No. 1. Record the theodolite horizontal scale reading.

c. Calculate and record the angle ($\theta 1$) between the alignment reference device and TARGET No. 1 line-of-sight.

d. Rotate the theodolite telescope 180° on its horizontal axis and then 180° on its vertical axis such that the telescope is inverted and pointed at TARGET No. 1.

e. Align the theodolite in azimuth to TARGET No. 1. Record the theodolite horizontal scale reading.

f. Align the theodolite in azimuth to the alignment reference device. Record the theodolite horizontal scale reading.

g. Calculate and record the angle ($\theta 1$) between TARGET No. 1 and the alignment reference device line-of-sight.

h. Rotate the theodolite telescope 180° on its horizontal axis and then 180° on its vertical axis such that the telescope is pointing at the alignment reference device.

i. Increase the theodolite horizontal circle scale reading by 45°.

19. Repeat step B.18 8 times to obtain 16 measurements of the angle ($\theta 1$) between TARGET No. 1 and the alignment reference device lines-of-sight. Calculate and record the average ($\bar{\theta} 1$) of the 16 measurements.

20. Position the theodolite at the intersection of the lines-of-sight of TARGET No. 2 and the alignment reference device.

21. Level the theodolite base to the plate spirit level and the telescope to the altitude level.

22. Align the theodolite in azimuth to the alignment reference device. Record the horizontal scale reading of the theodolite.

23. Rotate the theodolite through the angle ($\bar{\theta} 1$) recorded in step B.19 toward TARGET

DATE ________

No. 2. Record the horizontal scale reading of the theodolite.

24. Align TARGET No. 2 in elevation and azimuth as follows:

a. Level TARGET No. 2 using the vertical leveling mirror.

b. Sighting through TARGET No. 2, adjust the azimuth of TARGET No. 2 until the projected reticle pattern of the theodolite is superimposed on TARGET No. 2 reticle.

c. Repeat a and b as necessary until no further adjustment in elevation and azimuth is required.

25. Position the theodolite at the intersection of the lines-of-sight of TARGET No. 3 and the alignment reference device.

26. Level the theodolite base to the plate spirit level and the telescope to the altitude level.

27. Align the theodolite in azimuth to the alignment reference device. Record the horizontal scale reading of the theodolite.

28. Rotate the theodolite through the angle ($\bar{\theta} 1$) recorded in step B.19 plus 45°0'0" toward TARGET No. 3. Record the horizontal scale reading of the theodolite.

29. Align TARGET No. 3 in elevation and azimuth as follows:

a. Level TARGET No. 3 using the vertical leveling mirror.

b. Sighting through TARGET No. 3, adjust the azimuth of TARGET No. 3 until the projected reticle pattern of the theodolite is superimposed on TARGET No. 3 reticle.

c. Repeat a and b as necessary until no further adjustment in elevation and azimuth is required.

30. Remove the theodolite from TARGET No. 3 line-of-sight.

31. Hold the auxiliary eyepiece over TARGET No. 3 standard eyepiece and ascertain that both Target No. 3 scribe marks on the sextant alignment bar are within TARGET No. 3 field-of-view. Repeat steps B.2 and B.25 through B.29, if necessary, until the Target no. 3 scribe marks are within TARGET No. 3 field-of-view after performing step B.29.

32. Scribe a mark on the fixed plate of the 45° target pier in line with scribe mark on 45° autocollimator assembly.

33. Position the theodolite at the intersection of the lines-of-sight of TARGET No. 3 and the alignment reference device.

34. Level the theodolite base to the plate spirit level and the telescope to the altitude level.

35. Measure the angle ($\theta 3$) between the

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alignment reference device line-of-sight and TARGET No. 3 line-of-sight as follows:

a. Align the theodolite in azimuth to the alignment reference device. Record the theodolite horizontal scale reading.

b. Align the theodolite in azimuth to TARGET No. 3. Record the theodolite horizontal scale reading.

c. Calculate and record the angle ($\theta 3$) between the alignment reference device line-of-sight and TARGET No. 3 line-of-sight.

d. Rotate the theodolite telescope 180° on its horizontal axis and then 180° on its vertical axis such that the telescope is inverted and pointed at TARGET No. 3.

e. Align the theodolite in azimuth to TARGET No. 3. Record the theodolite horizontal scale reading.

f. Align the theodolite to the alignment reference device. Record the theodolite horizontal scale reading.

g. Calculate and record the angle ($\theta 3$) between TARGET No. 3 and the alignment reference device line-of-sight.

h. Rotate the theodolite telescope 180° on its horizontal axis and then 180° on its vertical axis such that the telescope is pointing at the alignment reference device.

i. Increase the theodolite horizontal circle scale reading by 45°.

36. Repeat step B.35 8 times to obtain 16 measurements of the angle ($\theta 3$) between TARGET No. 3 and the alignment reference device lines-of-sight. Calculate and record the average ($\bar{\theta} 3$) of the 16 measurements.

37. Position the theodolite at the intersection of the lines-of-sight of TARGET No. 4 and the alignment reference device.

38. Level the theodolite base to the plate spirit level and the telescope to the altitude level.

39. Align the theodolite in azimuth to the alignment reference device. Record the horizontal scale reading of the theodolite.

40. Rotate the theodolite through the angle ($\bar{\theta} 3$) recorded in step B.36 toward TARGET No. 4. Record the horizontal scale reading of the theodolite.

41. Align TARGET No. 4 in elevation and azimuth as follows:

a. Level TARGET No. 4 using the vertical leveling mirror.

b. Sighting through TARGET No. 4, adjust the azimuth of TARGET No. 4 until the projected reticle pattern of the theodolite is superimposed on TARGET No. 4 reticle.

c. Repeat a and b as necessary until no further adjustment in elevation and azimuth is required.

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42. Measure the angle (θ4) between the alignment reference device line-of-sight and TARGET No. 4 line-of-sight as follows:
   a. Align the theodolite in azimuth to the alignment reference device. Record the theodolite horizontal scale reading.
   b. Align the theodolite in azimuth to TARGET No. 4. Record the theodolite horizontal scale reading.
   c. Calculate and record the angle (θ4) between the alignment reference device and TARGET No. 4 lines-of-sight.
   d. Rotate the theodolite telescope 180° on its horizontal axis and then 180° on its vertical axis such that the telescope is inverted and pointed at TARGET No. 4.
   e. Align the theodolite in azimuth to TARGET No. 4. Record the theodolite horizontal scale reading.
   f. Align the theodolite in azimuth to the alignment reference device. Record the theodolite horizontal scale reading.
   g. Calculate and record the angle (θ 4) between TARGET No. 4 and the alignment reference device lines-of-sight.
   h. Rotate the theodolite telescope 180° on its horizontal axis and then 180° on its vertical axis such that the telescope is pointing at the alignment reference device.
   i. Increase the theodolite horizontal circle scale reading by 90°.

43. Repeat step B.42 four times to obtain eight measurements of the angle (θ4) between the alignment reference device line-of-sight and TARGET No. 4 line-of-sight. Calculate and record the average ($\bar{\theta}4$) of the eight measurements.

44. Remove the theodolite, sextant alignment bar, and alignment reference device.

C. CALCULATIONS

1. Calculate and record the included angle (ϕ3) between the lines-of-sight of TARGET No. 1 and TARGET No. 3 using the following formula:

$$\phi 3 = |\bar{\theta}3 - \bar{\theta}1|$$

2. Calculate and record the included angle (ϕ4) between the lines-of-sight of TARGET No. 1 and TARGET No. 4 using the following formula:

$$\phi 4 = |\bar{\theta}4 - \bar{\theta}1|$$

DATE ______

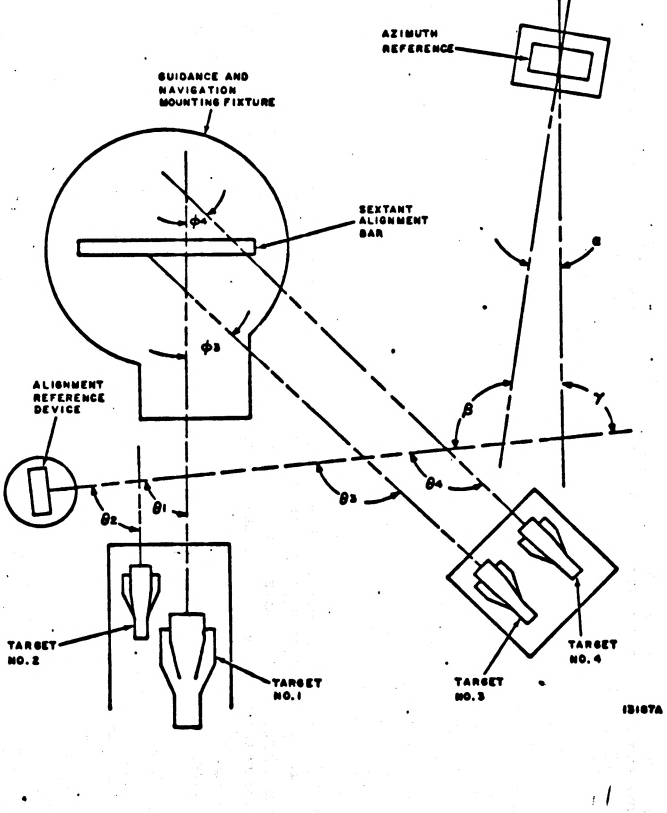

Figure 3. Position of Optical Targets

APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12223
REV -

JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

JDC ITEM NO.	PARAMETER	RECORDED VALUE			
		Degrees	Minutes	Seconds	10th of Seconds
B.39	Horizontal scale reading (reference)				
B.40	Horizontal scale reading (TARGET No. 4)				
B.43	$\bar{\theta}$4 (from calculation portion of data sheet)				
C.1	ϕ3 (from calculation portion of data sheet)				
C.2	ϕ4 (from calculation portion of data sheet)				

CALCULATIONS

CALCULATIONS FOR γ (JDC ITEM NO. B.7)

$\gamma = 180 - (\beta - \alpha)$

	Degrees	Minutes	Seconds	10th of Seconds
JDC ITEM NO. B.6 (-)JDC ITEM NO. B.5				
β (-) JDC ITEM NO. A.6 (α)				
	180	00	00	0
(-) (β - α) γ				

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EQUIPMENT TEST
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JDC
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INITIAL TDRR 29882

JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	RECORDED VALUE			
		Degrees	Minutes	Seconds	10th of Seconds
A.6	Facility azimuth reference (α)				
B.6	$\bar{\beta}$ (from calculation portion of data sheet)				
B.7	γ (from calculation portion of data sheet)				
B.10	Horizontal scale reading (reference)				
B.11	Horizontal scale reading (TARGET No. 1)				
B.19	$\bar{\theta}$1 (from calculation portion of data sheet)				
B.22	Horizontal scale reading (reference)				
B.23	Horizontal scale reading (TARGET No. 2)				
B.27	Horizontal scale reading (reference)				
B.28	Horizontal scale reading (TARGET No. 3)				
B.36	$\bar{\theta}$3 (from calculation portion of data sheet)				

DATE ______

APOLLO G&N
EQUIPMENT TEST
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JDC
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JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

CALCULATIONS FOR β
(JDC ITEM No. B.5)

PARAMETER	MEASUREMENT NUMBER											
	1				2				3			
Horizontal scale reading (alignment)	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (azimuth) (-)												
β												

PARAMETER	MEASUREMENT NUMBER			
	4			
Horizontal scale reading (alignment)	deg	min	sec	10th of sec
Horizontal scale reading (azimuth) (-)				
β				

CALCULATIONS FOR $\bar{\beta}$
(JDC ITEM No. B.6)

MEASUREMENT NUMBER	β			
	deg	min	sec	10th of sec
1				
2				
3				
4 (+)				
SUM				

$$\bar{\beta} = \frac{\text{SUM}}{4}$$

$$\frac{\quad}{4} =$$

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JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

CALCULATIONS FOR θ1
(JDC ITEM No. B.18)

PARAMETER	MEASUREMENT NUMBER											
	1				2				3			
Horizontal scale reading (reference)	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (TARGET No. 1) (-)												
θ1												

PARAMETER	MEASUREMENT NUMBER											
	4				5				6			
Horizontal scale reading (reference)	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (TARGET No. 1) (-)												
θ1												

PARAMETER	MEASUREMENT NUMBER											
	7				8				9			
Horizontal scale reading (reference)	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (TARGET No. 1) (-)												
θ1												

APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12223
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JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

CALCULATIONS FOR θ3
(JDC ITEM No. B.35)

PARAMETER	MEASUREMENT NUMBER											
	1				2				3			
Horizontal scale reading (reference)	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (TARGET No. 3) (-)												
θ3												

PARAMETER	MEASUREMENT NUMBER											
	4				5				6			
Horizontal scale reading (reference)	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (TARGET No. 3) (-)												
θ3												

PARAMETER	MEASUREMENT NUMBER											
	7				8				9			
Horizontal scale reading (reference)	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (TARGET No. 3) (-)												
θ3												

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EQUIPMENT TEST
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JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

CALCULATIONS FOR θ1
(JDC ITEM No. B.18 cont)

PARAMETER	MEASUREMENT NUMBER											
	10				11				12			
Horizontal scale reading (reference)	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (TARGET No. 1) (-)												
θ1												

PARAMETER	MEASUREMENT NUMBER											
	13				14				15			
Horizontal scale reading (reference)	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (TARGET No. 1) (-)												
θ1												

PARAMETER	MEASUREMENT NUMBER			
	16			
Horizontal scale reading (reference)	deg	min	sec	10th of sec
Horizontal scale reading (TARGET No. 1) (-)				
θ1				

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JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

CALCULATIONS FOR $\bar{\theta}1$
(JDC ITEM No. B.19)

MEASUREMENT NUMBER	θ1			
	deg	min	sec	10th of sec
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16 (+)				
SUM				

$$\bar{\theta}1 = \frac{SUM}{16}$$

$$\frac{\quad}{16} =$$

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JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

CALCULATIONS FOR θ3
(JDC ITEM No. B.35 cont)

PARAMETER	MEASUREMENT NUMBER											
	10				11				12			
	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (reference)												
Horizontal scale reading (TARGET No. 3) (-)												
θ3												

PARAMETER	MEASUREMENT NUMBER											
	13				14				15			
	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (reference)												
Horizontal scale reading (TARGET No. 3) (-)												
θ3												

PARAMETER	MEASUREMENT NUMBER			
	16			
	deg	min	sec	10th of sec
Horizontal scale reading (reference)				
Horizontal scale reading (TARGET No. 3) (-)				
θ3				

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EQUIPMENT TEST
DATA SHEET 9 OF 12

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JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

CALCULATIONS FOR $\bar{\theta}3$
(JDC ITEM No. B.36)

MEASUREMENT NUMBER	θ3			
	deg	min	sec	10th of sec
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16 (+)				
SUM				

$$\bar{\theta}3 = \frac{SUM}{16}$$

$$\frac{\quad}{16} =$$

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EQUIPMENT TEST
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JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

CALCULATIONS FOR θ4
(JDC ITEM No. B.42)

PARAMETER	MEASUREMENT NUMBER											
	1				2				3			
	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (reference)												
Horizontal scale reading (TARGET No. 4) (-)												
θ4												

PARAMETER	MEASUREMENT NUMBER											
	4				5				6			
	deg	min	sec	10th of sec	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (reference)												
Horizontal scale reading (TARGET No. 4) (-)												
θ4												

PARAMETER	MEASUREMENT NUMBER							
	7				8			
	deg	min	sec	10th of sec	deg	min	sec	10th of sec
Horizontal scale reading (reference)								
Horizontal scale reading (TARGET No. 4) (-)								
θ4								

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JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

CALCULATIONS FOR $\bar{\theta}4$
(JDC ITEM No. B.43)

MEASUREMENT NUMBER	$\theta 4$			
	deg	min	sec	10th of sec
1				
2				
3				
4				
5				
6				
7				
8 (+)				
SUM				

$$\bar{\theta}4 = \frac{SUM}{8}$$

$$\frac{\qquad}{8} =$$

APOLLO G&N
EQUIPMENT TEST
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JOB ALIGNMENT OF G&N SYSTEM OPTICAL TARGETS

CALCULATIONS FOR $\phi 3$
(JDC ITEM No. C.1)

$$\phi 3 = \left| \bar{\theta}3 - \bar{\theta}1 \right|$$

	Degrees	Minutes	Seconds	10th of Seconds
$\bar{\theta}3$ (-) $\bar{\theta}1$				
$\phi 3$				

CALCULATIONS FOR $\phi 4$
(JDC ITEM No. C.2)

$$\phi 4 = \left| \bar{\theta}4 - \bar{\theta}1 \right|$$

	Degrees	Minutes	Seconds	10th of Seconds
$\bar{\theta}4$ (-) $\bar{\theta}1$				
$\phi 4$				

DATE ____________

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 REV. A PAGE 1 OF 10

INITIAL TDRR 32758 D.S. PGS. 7

SUBSYSTEM BLOCK II G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

NOTE: The items marked (≠) are applicable only for SCA P/N 2007235 and are to be omitted for SCA P/N 2007234.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in output above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly 2900919 (observe placarding on bracket assembly for connector locations) and attach with hex nuts supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

3. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3 respectively.

4. Perform JDC 12204 to advance G & N system to STANDBY mode.

5. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

6. Connect PSA Test Point Adapter (TPA-2) direct probes to TB5 jack 26 (high) and TB5 jack 30 (low).

7. Set the Primary Signal Selector Voltmeter Input DVM to AUX position.

8. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28 (±0.25) vdc.

NOTE: The 28 vdc bus will cycle with the Heater Cycle.

9. Press OPTICS POWER ON pushbutton on Test Control panel.

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector Panel Position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record that the CMC lamp on the GNIC panel lights and then extinguishes. Record the DVM reading after the CMC lamp has extinguished.

PIPA G/S OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Zero Oscillograph channels 4, 5, and 6 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

9. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted.

---

10. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

11. Obtain Oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I by performing step 9 through 14.

12. Press PROCEED/ISS OPERATE pushbutton on Test Control panel.

NOTE: Do not wait 90 sec. Immediately go to next step.

13. Press IMU CAGE/COMMAND pushbutton.

14. Wait at least 10 seconds for PIPA loop closure, then press PROCEED/ISS STANDBY pushbutton.

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase output
118	Y PIPA G/S in-phase output
119	X PIPA G/S in-phase output

15. Stop Oscillograph. Turn Sensitivity to OFF. Check Oscillograph record for 3 indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5, and 6. Record that traces have centered after loop closure.

POWER SUPPLY AND TEMPERATURE

16. Press PROCEED/ISS OPERATE pushbutton on Test Control panel and wait 90 seconds, for wheel run-up completed, then repeat step A.8.

17. Measure and record the following voltages on the DVM. Measure all the X BAR voltages, then place the Primary Signal Selector to position 271 to measure the corresponding Test Selector panel positions:

Item	Voltage	X Bar	Test Selector Position
a.	120 vdc PIPA supply level	259	103
b.	2.5 vdc TM bias	N/A	104
c.	3200 cps 28V	123	106
d.	800 cps 28V 1% IMU	121	113
≠e.	800 cps 28V 1% Optics	101	128
f.	PIPA temp	255	201
≠g.	IRIG temp	156	202

≠18. Connect TPA-2 direct probes to TB4-21 hi ahd TB5-22 lo. Measure and record X BAR 299 voltage on the DVM.

≠19. Set the Test Selector to position 150 and X BAR to 271. Measure and record the DVM indication.

≠20. Connect TPA-2 direct probes to TB4-20 hi and TB5-33 lo. Measure and record X BAR 299 voltage on DVM.

≠21. Set the Test Selector to position 151 and X BAR to 271. Measure and record the DVM indication.

NOTE: In steps 20 and 21, an indication may or may not be present depending upon blower cycling.

IG, MG, AND OG SERVO ERRORS

22. Perform following DSKY operations:

a.	VERB 57		ENTR
b.	Observe		
	VERB 21	NOUN 01	Flashing
c.	00015		ENTR
d.	VERB 41	NOUN 20	ENTR
e.	Observe		
	VERB 21	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe		
	VERB 22	NOUN 22	Flashing
h.	+00000		ENTR
i.	Observe		
	VERB 23	NOUN 22	Flashing
j.	+00000		ENTR

23. Set OPTICS MODE switch on GNIC panel to MAN, then to ZERO OPTICS.

24. Connect following signals to Oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error
CHANNEL 2 to 2	MG servo error
CHANNEL 3 to 2	OG servo error
CHANNEL 8 to 4	SCA GDB stepper switch

25. Insure that CH 3 AC indicator is lighted.

26. Zero Oscillograph channels 1, 2, and 3 and set gains at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

27. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

28. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X 0.1
FREQUENCY meter to 2

29. Set the Oscillograph Signal Selector Channel 5 to 1 DC. Use the DC BALANCE CONTROL on the Signal Generator to center the trace about zero reference on the Oscillograph.

30. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

31. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

32. Set the GIMBAL SERVO TEST switch on the Test Selector panel to the appropriate position.

33. Press TEST START pushbutton on Test Selector panel.

34. Obtain an Oscillograph trace of stabilization loop servo error data by increasing

the Signal Generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds for each test listed in table II.

Table II

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

35. Stop Oscillograph. Turn SENS to OFF. Record ΔV SCA input signals monitored on channels 1, 2, and 3, and ΔV SCA output signals monitored on channel 8.

IG, MG, AND OG TORQUE MOTOR CURRENTS

≠36. Insure that AMPLITUDE control on Signal Generator is set to 0.

≠37. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

≠38. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

≠39. Zero Oscillograph channel 6 and set gain at 0.1 v/cm. Set gain of channel 8 at 1 v/cm and position channel 8 trace as near center as possible with a 2.5 dc bias input.

≠40. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

≠41. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠42. To monitor Signal Generator output on Oscillograph set the Oscillograph Signal Selector to channel 5-1 DC.

≠43. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

---

≠44. Stop Oscillograph. Record ΔV SCA input signal monitored on channel 6 and ΔV SCA output signal monitored on channel 8.

1X RESOLVER SIN AND COS

45. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +04500 ENTR

46. Wait 20 seconds after performing step 45, then perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Due to IMU drift steps 47.b and 47.c must be performed as rapidly as possible for each test listed in table IV.

47. Connect SCA output and SCA input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set CROSSBAR CONTROL switch to 271.
b. Set Test Selector panel to position listed and record DVM indication.
c. Immediately set CROSSBAR CONTROL switch on Primary Signal Selector panel to position listed and record DVM indication.

48. Perform following DSKY operations:

a. Verb 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

Table IV

Test	Test Selector Panel Position	CROSSBAR CONTROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

SHAFT AND TRUNNION CDU FINE ERROR

≠49. Set OPTICS switches on Indicator Control panel as follows:

MODE to MAN then to ZERO OPTICS
COUPLING to DIRECT
TELESCOPE TRUNNION to SLAVE to SXT

SPEED to LOW
TRACKER to OFF

≠50. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠51. Connect SCA shaft CDU fine error output to DVM by setting Test Selector panel to 146. Set Primary Signal Selector to X BAR 271.

≠52. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

≠53. Connect SCA shaft CDU fine error input to PAVM by connecting PSA TPA-2 buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low). On Aux Input panel run jumper from Probes output direct to PAVM input, and select PAVM Aux position on Primary Signal Select panel.

≠54. Set OPTICS MODE switch on Indicator Control Panel to MAN.

≠55. Perform following DSKY operations.

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

≠56. Position Optics Hand Controller on GNIC Panel to the left until the PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠57. Set OPTICS MODE switch to MAN then to ZERO OPTICS.

≠58. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠59. Connect SCA trunnion CDU fine error output to DVM by setting Test Selector panel to 147. Set Primary Signal Selector to X BAR 271.

≠60. Connect SCA trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

≠61. Repeat steps 54 and 55.

≠62. Position Optics Hand Controller on GNIC panel to a down position until PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠63. Set OPTICS MODE switch to MAN then to ZERO OPTICS.

≠64. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠65. Set OPTICS MODE switch on Indicator Control panel to MAN.

≠66. Perform following DSKY operations:

VERB 21 NOUN 10 ENTR
00012 ENTR
00010 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00012 ENTR
VERB 21 NOUN 01 ENTR
00053 ENTR
77100 ENTR
VERB 21 NOUN 01 ENTR
00054 ENTR
77100 ENTR

VERB 21 NOUN 10 ENTR
00014 ENTR
06000 ENTR

67. Connect SCA trunnion CDU DAC output to DVM by setting Test Selector panel to 126 and Primary Signal Selector X BAR to 271. Record DVM indication.

68. Connect SCA shaft CDU DAC output to DVM by setting Test Selector panel to 127 and Primary Signal Selector X BAR to 271. Record DVM indication.

69. Set OPTICS MODE switch on Indicator Control panel to CMC. Wait 10 seconds, then set OPTICS MODE switch to ZERO.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

≠70. Set Test Selector panel to 129.

≠71. Connect SCA SXT Shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

≠72. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠73. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

≠74. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS MODE switch to MAN.

≠75. Hold Optics Hand Controller to left limit not longer than 20 seconds.

≠76. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

≠77. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph.

≠78. Connect SCA SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

≠79. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠80. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠81. Set OPTICS SPEED switch on Indicator Control panel to HI.

≠82. Hold Optics Hand Controller to right limit for approximately 20 seconds.

≠83. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

≠84. Set Test Selector panel to 130 to connect SCA SXT trunnion tach output to Oscillograph.

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SUBSYSTEM BLOCK II G & N SYSTEM | ASSY

≠85. Connect SCA SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

≠86. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠87. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠88. Set OPTICS SPEED switch on Indicator Control panel to MED.

≠89. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

≠90. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

≠91. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph.

≠92. Connect SCA SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

≠93. Insure that CH 5 AC indicator is lighted.

≠94. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠95. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

≠96. Set OPTICS SPEED switch on Indicator Control panel to HI.

≠97. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

≠98. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

≠99. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

≠100. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 101. Ignore lamp indication.

≠101. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +01600 ENTR

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d. Observe
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

≠102. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM select switch to Aux position on Primary Signal Select panel.

≠103. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA input on PAVM and SCA output on DVM (X BAR 271) for each test.

104. Perform JDC 12204 to turn off G& N system.

105. Perform calculations on data sheets.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

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APOLLO G&N
EQUIPMENT TEST
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JDC
NO. 12224
REV A
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate		vdc	3.9		4.9		
	28 vdc IMU standby		vdc	3.9		4.9		
	28 vdc optics operate		vdc	3.9		4.9		
B.5	Lamp operation		▨	▨		▨		
	CMC warning		vdc	3.9		4.9		
B.15	Loop closure test 1		▨	▨		▨		
	Loop closure test 2		▨	▨		▨		
	Loop closure test 3		▨	▨		▨		
B.17	120 vdc PIPA Supply	XBAR 259	vdc	▨		▨		
		TES 103	vdc	2.3		4.7		
	2.5 vdc TM Bias TES 104		vdc	2.45		2.55		

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JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.17 (cont)	3200 cps 28V	XBAR 123	vac	▨		▨		
		TES 106	vdc	4.2		4.8		
	800 cps 28V IMU	XBAR 121	vac	▨		▨		
		TES 113	vdc	4.2		4.8		
	800 cps 28V Optics	XBAR 101	vac	▨		▨		
		TES 128	vdc	4.2		4.8		
	PIPA temp	XBAR 255	vdc	▨		▨		
		TES 201	vdc	2.0		3.5		
	IRIG temp	XBAR 156	vdc	▨		▨		
		TES 202	vdc	2.37		3.75		
B.18	IMU HEATER current		vdc	▨		▨		
B.19	IMU HEATER current		vdc	3.9		4.8		
B.20	IMU BLOWER current		vac	▨		▨		
B.21	IMU BLOWER current		vdc	4.0		4.6		
B.34.a	IG servo error channel 1		Δv	▨		▨		
	IG servo error channel 8		Δv	channel 1 x 0.4		channel 1 x 0.8		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.34.b	MG servo error channel 2	Δv	▨		▨		✓
	MG servo error channel 8	Δv	channel 2 x 0.4		channel 2 x 0.8		
B.34.c	OG servo error channel 3	Δv	▨		▨		
	OG servo error channel 8	Δv	channel 3 x 0.4		channel 3 x 0.8		
B.44.a	IG torque motor current channel 6	Δv	▨		▨		✓
	IG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		✓
B.44.b	MG torque motor current channel 6	Δv	▨		▨		✓
	MG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		✓
B.44.c	OG torque motor current channel 6	Δv	▨		▨		✓
	OG torque motor current channel 8	Δv	channel 6 x 1.8		channel 6 x 3.8		✓
B.47.b	IG 1X resolver cos (Test a) TES 120	vdc	▨		▨		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.c	IG 1X resolver cos (Test a) XBAR 243	vac	▨		▨		
B.47.b	MG 1X resolver cos (Test b) TES 121	vdc	▨		▨		
B.47.c	MG 1X resolver cos (Test b) XBAR 242	vac	▨		▨		
B.47.b	OG 1X resolver cos (Test c) TES 122	vdc	▨		▨		
B.47.c	OG 1X resolver cos (Test c) XBAR 241	vac	▨		▨		
B.47.b	IG 1X resolver sin (Test d) TES 123	vdc	▨		▨		
B.47.c	IG 1X resolver sin (Test d) XBAR 144	vac	▨		▨		
B.47.b	MG 1X resolver sin (Test e) TES 124	vdc	▨		▨		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.c	MG 1X resolver sin (Test e) XBAR 143	vac	▨		▨		
B.47.b	OG 1X resolver sin (Test f) TES 125	vdc	▨		▨		
B.47.c	OG 1X resolver sin (Test f) XBAR 142	vac	▨		▨		
B.56	Shaft CDU fine error	vdc	4.35		4.81		✓
B.62	Trunnion CDU fine error	vdc	4.35		4.81		✓
B.67	Trunnion CDU DAC output	vdc	4.00		5.00		
B.68	Shaft CDU DAC output	vdc	4.00		5.00		
B.76	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 4.0		channel 1 x 6.0		✓
B.83	SCA input channel 1	Δv	▨		▨		✓
	SCA output channel 8	Δv	channel 1 x 0.4		channel 1 x 0.6		✓

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EQUIPMENT TEST
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REV A

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.90	SCA input channel 2	Δv	▨		▨		✓
	SCA output channel 8	Δv	channel 2 x 4.0		channel 2 x 6.0		✓
B.98	SCA input channel 5	Δv	▨		▨		✓
	SCA output channel 8	Δv	channel 5 x 0.4		channel 5 x 0.6		✓
B.103.a	Roll attitude error (PAVM)	vac	▨		▨		✓
	Roll attitude error (DVM)	vdc	▨		▨		✓
B.103.b	Yaw attitude error (PAVM)	vac	▨		▨		✓
	Yaw attitude error (DVM)	vdc	▨		▨		✓
B.103.c	Pitch attitude error (PAVM)	vac	▨		▨		✓
	Pitch attitude error (DVM)	vdc	▨		▨		✓

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EQUIPMENT TEST
DATA SHEET 7 **OF** 7

JDC
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REV. A

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS	REJ	ACC	
B.47	IG 1X resolver cos = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$			
	MG 1X resolver cos = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$			
	OG 1X resolver cos = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$			
	IG 1X resolver sin = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$			
	MG 1X resolver sin = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$			
	OG 1X resolver sin = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$			
B.103.a	Roll attitude error = $\frac{2.44\ (\text{SCA output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$			≠
B.103.b	Yaw attitude error = $\frac{2.44\ (\text{SCA output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$			≠
B.103.c	Pitch attitude error = $\frac{2.44\ (\text{SCA output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$			≠

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BLOCK II SIGNAL CONDITIONER
JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM BLOCK II G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: The items marked (≠) are applicable only for SCA P/N 2007235 and are to be omitted for SCA P/N 2007234.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in output above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly 2900919 (observe placarding on bracket assembly for connector locations) and attach with hex nuts supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

3. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3 respectively.

4. Perform JDC 12204 to advance G & N system to STANDBY mode.

5. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

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6. Connect PSA Test Point Adapter (TPA-2) direct probes to TB5 jack 26 (high) and TB5 jack 30 (low).

7. Set the Primary Signal Selector Voltmeter Input DVM to AUX position.

8. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28 (±0.25) vdc.

NOTE: The 28 vdc bus will cycle with the Heater Cycle.

9. Press OPTICS POWER ON pushbutton on Test Control panel.

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector Panel Position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record that the CMC lamp on the GNIC panel lights and then extinguishes. Record the DVM reading after the CMC lamp has extinguished.

PIPA G/S OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Zero Oscillograph channels 4, 5, and 6 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

9. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted.

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10. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

11. Obtain Oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I by performing step 9 through 14.

12. Press PROCEED/ISS OPERATE pushbutton on Test Control panel.

NOTE: Do not wait 90 sec. Immediately go to next step.

13. Press IMU CAGE/COMMAND pushbutton.

14. Wait at least 10 seconds for PIPA loop closure, then press PROCEED/ISS STANDBY pushbutton.

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase output
118	Y PIPA G/S in-phase output
119	X PIPA G/S in-phase output

15. Stop Oscillograph. Turn Sensitivity to OFF. Check Oscillograph record for 3 indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5, and 6. Record that traces have centered after loop closure.

POWER SUPPLY AND TEMPERATURE

16. Press PROCEED/ISS OPERATE pushbutton on Test Control panel and wait 90 seconds, for wheel run-up completed, then repeat step A.8.

17. Measure and record the following voltages on the DVM. Measure all the X BAR voltages, then place the Primary Signal Selector to position 271 to measure the corresponding Test Selector panel positions:

Item	Voltage	X Bar	Test Selector Position
a.	120 vdc PIPA supply level	259	103
b.	2.5 vdc TM bias	N/A	104
c.	3200 cps 28V	123	106
d.	800 cps 28V 1% IMU	121	113
≠e.	800 cps 28V 1% Optics	101	128
f.	PIPA temp	255	201
≠g.	IRIG temp	156	202

≠18. Connect TPA-2 direct probes to TB4-21 hi and TB5-22 lo. Measure and record X BAR 299 voltage on the DVM.

≠19. Set the Test Selector to position 150 and X BAR to 271. Measure and record the DVM indication.

≠20. Connect TPA-2 direct probes to TB4-20 hi and TB5-33 lo. Measure and record X BAR 299 voltage on DVM.

≠21. Set the Test Selector to position 151 and X BAR to 271. Measure and record the DVM indication.

NOTE: In steps 20 and 21, an indication may or may not be present depending upon blower cycling.

IG, MG, AND OG SERVO ERRORS

22. Perform following DSKY operations:

a. VERB 57		ENTR
b. Observe		
VERB 21	NOUN 01	Flashing
c. 00015		ENTR
d. VERB 41	NOUN 20	ENTR
e. Observe		
VERB 21	NOUN 22	Flashing
f. +00000		ENTR
g. Observe		
VERB 22	NOUN 22	Flashing
h. +00000		ENTR
i. Observe		
VERB 23	NOUN 22	Flashing
j. +00000		ENTR

23. Set OPTICS MODE switch on GNIC panel to MAN, then to ZERO OPTICS.

24. Connect following signals to Oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error
CHANNEL 2 to 2	MG servo error
CHANNEL 3 to 2	OG servo error
CHANNEL 8 to 4	SCA GDB stepper switch

25. Insure that CH 3 AC indicator is lighted.

26. Zero Oscillograph channels 1, 2, and 3 and set gains at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

27. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

28. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X 0.1
FREQUENCY meter to 2

29. Set the Oscillograph Signal Selector Channel 5 to 1 DC. Use the DC BALANCE CONTROL on the Signal Generator to center the trace about zero reference on the Oscillograph.

30. Perform following DSKY operations:

a. VERB 42	ENTR
b. VERB 33	ENTR

31. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

32. Set the GIMBAL SERVO TEST switch on the Test Selector panel to the appropriate position.

33. Press TEST START pushbutton on Test Selector panel.

34. Obtain an Oscillograph trace of stabilization loop servo error data by increasing

the Signal Generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds for each test listed in table II.

Table II

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

35. Stop Oscillograph. Turn SENS to OFF. Record ΔV SCA input signals monitored on channels 1, 2, and 3, and ΔV SCA output signals monitored on channel 8.

IG, MG, AND OG TORQUE MOTOR CURRENTS

≠36. Insure that AMPLITUDE control on Signal Generator is set to 0.

≠37. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

≠38. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

≠39. Zero Oscillograph channel 6 and set gain at 0.1 v/cm. Set gain of channel 8 at 1 v/cm and position channel 8 trace as near center as possible with a 2.5 dc bias input.

≠40. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

≠41. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠42. To monitor Signal Generator output on Oscillograph set the Oscillograph Signal Selector to channel 5-1 DC.

≠43. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

≠44. Stop Oscillograph. Record ΔV SCA input signal monitored on channel 6 and ΔV SCA output signal monitored on channel 8.

1X RESOLVER SIN AND COS

45. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +04500 ENTR

46. Wait 20 seconds after performing step 45, then perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Due to IMU drift steps 47.b and 47.c must be performed as rapidly as possible for each test listed in table IV.

47. Connect SCA output and SCA input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set CROSSBAR CONTROL switch to 271.
b. Set Test Selector panel to position listed and record DVM indication.
c. Immediately set CROSSBAR CONTROL switch on Primary Signal Selector panel to position listed and record DVM indication.

48. Perform following DSKY operations:

a. Verb 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22. Flashing
g. +00000 ENTR

Table IV

Test	Test Selector Panel Position	CROSSBAR CONTROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

SHAFT AND TRUNNION CDU FINE ERROR

≠49. Set OPTICS switches on Indicator Control panel as follows:

MODE to MAN then to ZERO OPTICS
COUPLING to DIRECT
TELESCOPE TRUNNION to SLAVE to SXT

SPEED to LOW
TRACKER to OFF

≠50. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠51. Connect SCA shaft CDU fine error output to DVM by setting Test Selector panel to 146. Set Primary Signal Selector to X BAR 271.

≠52. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

≠53. Connect SCA shaft CDU fine error input to PAVM by connecting PSA TPA-2 buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low). On Aux Input panel run jumper from Probes output direct to PAVM input, and select PAVM Aux position on Primary Signal Select panel.

≠54. Set OPTICS MODE switch on Indicator Control Panel to MAN.

≠55. Perform following DSKY operations.

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

≠56. Position Optics Hand Controller on GNIC Panel to the left until the PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠57. Set OPTICS MODE switch to MAN then to ZERO OPTICS.

≠58. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠59. Connect SCA trunnion CDU fine error output to DVM by setting Test Selector panel to 147. Set Primary Signal Selector to X BAR 271.

≠60. Connect SCA trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

≠61. Repeat steps 54 and 55.

≠62. Position Optics Hand Controller on GNIC panel to a down position until PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠63. Set OPTICS MODE switch to MAN then to ZERO OPTICS.

≠64. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠65. Set OPTICS MODE switch on Indicator Control panel to MAN.

≠66. Perform following DSKY operations:

VERB 21 NOUN 10 ENTR
00012 ENTR
00010 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00012 ENTR
VERB 21 NOUN 01 ENTR
00053 ENTR
77100 ENTR
VERB 21 NOUN 01 ENTR
00054 ENTR
77100 ENTR

VERB 21 NOUN 10 ENTR
00014 ENTR
06000 ENTR

67. Connect SCA trunnion CDU DAC output to DVM by setting Test Selector panel to 126 and Primary Signal Selector X BAR to 271. Record DVM indication.

68. Connect SCA shaft CDU DAC output to DVM by setting Test Selector panel to 127 and Primary Signal Selector X BAR to 271. Record DVM indication.

69. Set OPTICS MODE switch on Indicator Control panel to CMC. Wait 10 seconds, then set OPTICS MODE switch to ZERO.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

≠70. Set Test Selector panel to 129.

≠71. Connect SCA SXT Shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

≠72. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠73. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

≠74. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS MODE switch to MAN.

≠75. Hold Optics Hand Controller to left limit not longer than 20 seconds.

≠76. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

≠77. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph.

≠78. Connect SCA SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

≠79. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠80. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠81. Set OPTICS SPEED switch on Indicator Control panel to HI.

≠82. Hold Optics Hand Controller to right limit for approximately 20 seconds.

≠83. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

≠84. Set Test Selector panel to 130 to connect SCA SXT trunnion tach output to Oscillograph.

#85. Connect SCA SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

#86. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#87. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

#88. Set OPTICS SPEED switch on Indicator Control panel to MED.

#89. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

#90. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

#91. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph.

#92. Connect SCA SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

#93. Insure that CH 5 AC indicator is lighted.

#94. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#95. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

#96. Set OPTICS SPEED switch on Indicator Control panel to HI.

#97. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

#98. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

#99. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

#100. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 101. Ignore lamp indication.

#101. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +01600 ENTR

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d. Observe
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

#102. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM select switch to Aux position on Primary Signal Select panel.

#103. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA input on PAVM and SCA output on DVM (X BAR 271) for each test.

104. Perform JDC 12204 to turn off G & N system.

105. Perform calculations on data sheets.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

NO. 12224 JDC
REV B
INITIAL TORR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE ____________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE
NAME ____________ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate		vdc	3.9		4.9		
	28 vdc IMU standby		vdc	3.9		4.9		
	28 vdc optics operate		vdc	3.9		4.9		
B.5	Lamp operation		▨	▨		▨		
	CMC warning		vdc	3.9		4.9		
B.15	Loop closure test 1		▨	▨		▨		
	Loop closure test 2		▨	▨		▨		
	Loop closure test 3		▨	▨		▨		
B.17	120 vdc PIPA Supply	XBAR 259	vdc	▨		▨		
		TES 103	vdc	2.3		4.7		
	2.5 vdc TM Bias TES 104		vdc	2.45		2.55		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12224
REV B

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.17 (cont)	3200 cps 28V	XBAR 123	vac	▨		▨		
		TES 106	vdc	4.2		4.8		
	800 cps 28V IMU	XBAR 121	vac	▨		▨		
		TES 113	vdc	4.2		4.8		
	800 cps 28V Optics	XBAR 101	vac	▨		▨		
		TES 128	vdc	4.2		4.8		
	PIPA temp	XBAR 255	vdc	▨		▨		
		TES 201	vdc	2.0		3.5		
	IRIG temp	XBAR 156	vdc	▨		▨		
		TES 202	vdc	2.37		3.75		
B.18	IMU HEATER current		vdc	▨		▨		
B.19	IMU HEATER current		vdc	3.9		4.8		
B.20	IMU BLOWER current		vac	▨		▨		
B.21	IMU BLOWER current		vdc	4.0		4.6		
B.34.a	IG servo error channel 1		Δv	▨		▨		
	IG servo error channel 8		Δv	channel 1 x 0.4		channel 1 x 0.8		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 7

JDC NO. 12224
REV B

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.34.b	MG servo error channel 2	Δv	▨		▨		
	MG servo error channel 8	Δv	channel 2 x 0.4		channel 2 x 0.8		
B.34.c	OG servo error channel 3	Δv	▨		▨		
	OG servo error channel 8	Δv	channel 3 x 0.4		channel 3 x 0.8		
B.44.a	IG torque motor current channel 6	Δv	▨		▨		
	IG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.b	MG torque motor current channel 6	Δv	▨		▨		
	MG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.c	OG torque motor current channel 6	Δv	▨		▨		
	OG torque motor current channel 8	Δv	channel 6 x 1.8		channel 6 x 3.8		
B.47.b	IG 1X resolver cos (Test a) TES 120	vdc	▨		▨		

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EQUIPMENT TEST
DATA SHEET 4 **OF** 7

JDC NO. 12224
REV B

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.c	IG 1X resolver cos (Test a) XBAR 243	vac	▨		▨		
B.47.b	MG 1X resolver cos (Test b) TES 121	vdc	▨		▨		
B.47.c	MG 1X resolver cos (Test b) XBAR 242	vac	▨		▨		
B.47.b	OG 1X resolver cos (Test c) TES 122	vdc	▨		▨		
B.47.c	OG 1X resolver cos (Test c) XBAR 241	vac	▨		▨		
B.47.b	IG 1X resolver sin (Test d) TES 123	vdc	▨		▨		
B.47.c	IG 1X resolver sin (Test d) XBAR 144	vac	▨		▨		
B.47.b	MG 1X resolver sin (Test e) TES 124	vdc	▨		▨		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 **OF** 7

JDC NO. 12224
REV B

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.c	MG 1X resolver sin (Test e) XBAR 143	vac	▨		▨		
B.47.b	OG 1X resolver sin (Test f) TES 125	vdc	▨		▨		
B.47.c	OG 1X resolver sin (Test f) XBAR 142	vac	▨		▨		
B.56	Shaft CDU fine error	vdc	4.35		4.81		
B.62	Trunnion CDU fine error	vdc	4.35		4.81		
B.67	Trunnion CDU DAC output	vdc	4.00		5.00		
B.68	Shaft CDU DAC output	vdc	4.00		5.00		
B.76	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 4.0		channel 1 x 6.0		
B.83	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 0.4		channel 1 x 0.6		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 **OF** 7

JDC NO. 12224
REV B

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.90	SCA input channel 2	Δv	▨		▨		
	SCA output channel 8	Δv	channel 2 x 4.0		channel 2 x 6.0		
B.98	SCA input channel 5	Δv	▨		▨		
	SCA output channel 8	Δv	channel 5 x 0.4		channel 5 x 0.6		
B.103.a	Roll attitude error (PAVM)	vac	▨		▨		
	Roll attitude error (DVM)	vdc	▨		▨		
B.103.b	Yaw attitude error (PAVM)	vac	▨		▨		
	Yaw attitude error (DVM)	vdc	▨		▨		
B.103.c	Pitch attitude error (PAVM)	vac	▨		▨		
	Pitch attitude error (DVM)	vdc	▨		▨		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC
NO. 12224
REV. B

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS	REJ	AC
B.47	IG 1X resolver cos = $\frac{8.1\ \text{(SCA output (DVM) (TES) - 2.5 vdc bias)}}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver cos = $\frac{8.1\ \text{(SCA output (DVM) (TES) - 2.5 vdc bias)}}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver cos = $\frac{8.1\ \text{(SCA output (DVM) (TES) - 2.5 vdc bias)}}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	IG 1X resolver sin = $\frac{8.1\ \text{(SCA output (DVM) (TES) - 2.5 vdc bias)}}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver sin = $\frac{8.1\ \text{(SCA output (DVM) (TES) - 2.5 vdc bias)}}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver sin = $\frac{8.1\ \text{(SCA output (DVM) (TES) - 2.5 vdc bias)}}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
B.103.a	Roll attitude error = $\frac{2.44\ \text{(SCA output (DVM) - 2.5 vdc bias)}}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.b	Yaw attitude error = $\frac{2.44\ \text{(SCA output (DVM) - 2.5 vdc bias)}}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.c	Pitch attitude error = $\frac{2.44\ \text{(SCA output (DVM) - 2.5 vdc bias)}}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 REV. C PAGE 1 OF 10

INITIAL TDRR 32758 D.S. PGS 7

SUBSYSTEM BLOCK II G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-
C	9-22-67	34705	1, 2, 4	2	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: The items marked (≠) are applicable only for SCA P/N 2007235 and are to be omitted for SCA P/N 2007234.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in cutout above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly 2900919 (observe placarding on bracket assembly for connector locations) and attach with hex nuts supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

3. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3 respectively.

4. Perform JDC 12204 to advance G & N system to STANDBY mode.

5. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 REV C PAGE 2 OF 10

SUBSYSTEM BLOCK II G & N SYSTEM

ASSY

6. Connect PSA Test Point Adapter (TPA-2) direct probes to TB5 jack 26 (high) and TB5 jack 30 (low).

7. Set the Primary Signal Selector VOLTMETER INPUT DVM switch to AUX position.

8. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28 (±0.25) vdc.

NOTE: The 28 vdc bus will cycle with the Heater Cycle.

9. Press OPTICS POWER ON pushbutton on Test Control panel.

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector Panel Position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record that the CMC lamp on the GNIC panel lights and then extinguishes. Record the DVM reading after the CMC lamp has extinguished.

PIPA G/S OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Zero Oscillograph channels 4, 5, and 6 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by offsetting zero line 12 1/2 mm to right of chart centerline.

9. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted.

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 REV C PAGE 3 OF 10

SUBSYSTEM BLOCK II G & N SYSTEM

ASSY

10. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

11. Obtain Oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I by performing step 9 through 14.

12. Press PROCEED/ISS OPERATE pushbutton on Test Control panel.

NOTE: Do not wait 90 sec. Immediately go to next step.

13. Press IMU CAGE/COMMAND pushbutton.

14. Wait at least 10 seconds for PIPA loop closure, then press PROCEED/ISS STANDBY pushbutton.

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase output
118	Y PIPA G/S in-phase output
119	X PIPA G/S in-phase output

15. Stop Oscillograph. Turn Sensitivity to OFF. Check Oscillograph record for 3 indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5, and 6. Record that traces have centered after loop closure.

POWER SUPPLY AND TEMPERATURE

16. Press PROCEED/ISS OPERATE pushbutton on Test Control panel and wait 90 seconds, for wheel run-up completed, then repeat step A.8.

17. Measure and record the following voltages on the DVM. Measure all the X BAR voltages, then place the Primary Signal Selector to position 271 to measure the corresponding Test Selector panel positions.

Item	Voltage	X Bar	Test Selector Position
a.	120 vdc PIPA supply level	259	103
b.	2.5 vdc TM bias	N/A	104
c.	3200 cps 28V	123	106
d.	800 cps 28V 1% IMU	121	113
≠e.	800 cps 28V 1% Optics	101	128
f.	PIPA temp	255	201
≠g.	IRIG temp	156	202

≠18. Connect TPA-2 direct probes to TB4-21 hi and TB5-22 lo. Measure and record X BAR 299 voltage on the DVM.

≠19. Set the Test Selector to position 150 and X BAR to 271. Measure and record the DVM indication.

≠20. Connect TPA-2 direct probes to TB4-20 hi and TB5-33 lo. Measure and record X BAR 299 voltage on DVM.

≠21. Set the Test Selector to position 151 and X BAR to 271. Measure and record the DVM indication.

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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SUBSYSTEM BLOCK II G & N SYSTEM

ASSY

NOTE: In steps 20 and 21, an indication may or may not be present depending upon blower cycling.

IG, MG, AND OG SERVO ERRORS

22. Perform following DSKY operations:

a.	VERB 57		ENTR
b.	Observe		
	VERB 21	NOUN 01	Flashing
c.	00015		ENTR
d.	VERB 41	NOUN 20	ENTR
e.	Observe		
	VERB 21	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe		
	VERB 22	NOUN 22	Flashing
h.	+00000		ENTR
i.	Observe		
	VERB 23	NOUN 22	Flashing
j.	+00000		ENTR

23. Set OPTICS MODE switch on GNIC panel to MAN, then to ZERO OPTICS.

24. Connect following signals to Oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error
CHANNEL 2 to 2	MG servo error
CHANNEL 3 to 2	OG servo error
CHANNEL 8 to 4	SCA GDB stepper switch

25. Insure that CH 3 AC indicator is lighted.

26. Zero Oscillograph channels 1, 2, and 3 and set gains at 50 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by offsetting zero line 12 1/2 mm to right of chart centerline.

27. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

28. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X 0.1
FREQUENCY meter to 2

29. Set the Oscillograph Signal Selector Channel 5 to 1 DC. Use the DC BALANCE CONTROL on the Signal Generator to center the trace about zero reference on the Oscillograph.

30. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

31. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

32. Set the GIMBAL SERVO TEST switch on the Test Selector panel to the appropriate position.

33. Press TEST START pushbutton on Test Selector panel.

34. Obtain an Oscillograph trace of stabilization loop servo error data by increasing

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the Signal Generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds for each test listed in table II.

Table II

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

35. Stop Oscillograph. Turn SENS to OFF. Record ΔV SCA input signals monitored on channels 1, 2, and 3, and ΔV SCA output signals monitored on channel 8.

IG, MG, AND OG TORQUE MOTOR CURRENTS

≠36. Insure that AMPLITUDE control on Signal Generator is set to 0.

≠37. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

≠38. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

≠39. Zero Oscillograph channel 6 and set gain at 0.1 v/cm. Set gain of channel 8 at 1 v/cm and position channel 8 trace as near center as possible with a 2.5 dc bias input.

≠40. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

≠41. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠42. To monitor Signal Generator output on Oscillograph set the Oscillograph Signal Selector to channel 5-1 DC.

≠43. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

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≠44. Stop Oscillograph. Record ΔV SCA input signal monitored on channel 6 and ΔV SCA output signal monitored on channel 8.

1X RESOLVER SIN AND COS

45. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +04500 ENTR

46. Wait 20 seconds after performing step 45, then perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Due to IMU drift steps 47.b and 47.c must be performed as rapidly as possible for each test listed in table IV.

47. Connect SCA output and SCA input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set CROSSBAR CONTROL switch to 271.
b. Set Test Selector panel to position listed and record DVM indication.
c. Immediately set CROSSBAR CONTROL switch on Primary Signal Selector panel to position listed and record DVM indication.

48. Perform following DSKY operations:

a. Verb 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

Table IV

Test	Test Selector Panel Position	CROSS-BAR CON-TROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

SHAFT AND TRUNNION CDU FINE ERROR

≠49. Set OPTICS switches on Indicator Control panel as follows:

MODE to MAN then to ZERO OPTICS
COUPLING to DIRECT
TELESCOPE TRUNNION to SLAVE to SXT

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SPEED to LOW
TRACKER to OFF

≠50. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠51. Connect SCA shaft CDU fine error output to DVM by setting Test Selector panel to 146. Set Primary Signal Selector to X BAR 271.

≠52. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

≠53. Connect SCA shaft CDU fine error input to PAVM by connecting PSA TPA-2 buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low). On Aux Input panel run jumper from Probes output direct to PAVM input, and select PAVM Aux position on Primary Signal Select panel.

≠54. Set OPTICS MODE switch on Indicator Control Panel to MAN.

≠55. Perform following DSKY operations.

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

≠56. Position Optics Hand Controller on GNIC Panel to the left until the PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠57. Set OPTICS MODE switch to MAN then to ZERO OPTICS.

≠58. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠59. Connect SCA trunnion CDU fine error output to DVM by setting Test Selector panel to 147. Set Primary Signal Selector to X BAR 271.

≠60. Connect SCA trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

≠61. Repeat steps 54 and 55.

≠62. Position Optics Hand Controller on GNIC panel to a down position until PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠63. Set OPTICS MODE switch to MAN then to ZERO OPTICS.

≠64. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠65. Set OPTICS MODE switch on Indicator Control panel to MAN.

≠66. Perform following DSKY operations:

VERB 21 NOUN 10 ENTR
00012 ENTR
00010 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00012 ENTR
VERB 21 NOUN 01 ENTR
00053 ENTR
77100 ENTR
VERB 21 NOUN 01 ENTR
00054 ENTR
77100 ENTR

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VERB 21 NOUN 10 ENTR
00014 ENTR
06000 ENTR

67. Connect SCA trunnion CDU DAC output to DVM by setting Test Selector panel to 126 and Primary Signal Selector X BAR to 271. Record DVM indication.

68. Connect SCA shaft CDU DAC output to DVM by setting Test Selector panel to 127 and Primary Signal Selector X BAR to 271. Record DVM indication.

69. Set OPTICS MODE switch on Indicator Control panel to CMC. Wait 10 seconds, then set OPTICS MODE switch to ZERO.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

≠70. Set Test Selector panel to 129.

≠71. Connect SCA SXT Shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

≠72. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠73. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

≠74. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS MODE switch to MAN.

≠75. Hold Optics Hand Controller to left limit not longer than 20 seconds.

≠76. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

≠77. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph.

≠78. Connect SCA SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

≠79. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠80. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠81. Set OPTICS SPEED switch on Indicator Control panel to HI.

≠82. Hold Optics Hand Controller to right limit for approximately 20 seconds.

≠83. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

≠84. Set Test Selector panel to 130 to connect SCA SXT trunnion tach output to Oscillograph.

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≠85. Connect SCA SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

≠86. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠87. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠88. Set OPTICS SPEED switch on Indicator Control panel to MED.

≠89. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

≠90. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

≠91. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph.

≠92. Connect SCA SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

≠93. Insure that CH 5 AC indicator is lighted.

≠94. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠95. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

≠96. Set OPTICS SPEED switch on Indicator Control panel to HI.

≠97. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

≠98. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

≠99. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

≠100. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 101. Ignore lamp indication.

≠101. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +01600 ENTR

---

d. Observe
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

≠102. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM select switch to Aux position on Primary Signal Select panel.

≠103. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA input on PAVM and SCA output on DVM (X BAR 271) for each test.

104. Perform JDC 12204 to turn off G & N system.

105. Perform calculations on data sheets.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12224
REV C
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate		vdc	3.9		4.9		
	28 vdc IMU standby		vdc	3.9		4.9		
	28 vdc optics operate		vdc	3.9		4.9		
B.5	Lamp operation		▨	▨		▨		
	CMC warning		vdc	3.9		4.9		
B.15	Loop closure test 1		▨	▨		▨		
	Loop closure test 2		▨	▨		▨		
	Loop closure test 3		▨	▨		▨		
B.17	120 vdc PIPA Supply	XBAR 259	vdc	▨		▨		
		TES 103	vdc	2.3		4.7		
	2.5 vdc TM Bias TES 104		vdc	2.45		2.55		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12224
REV C

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
B.17 (cont)	3200 cps 28V	XBAR 123	vac	▨		▨			
		TES 106	vdc	4.2		4.8			
	800 cps 28V IMU	XBAR 121	vac	▨		▨			
		TES 113	vdc	4.2		4.8			
	800 cps 28V Optics	XBAR 101	vac	▨		▨			
		TES 128	vdc	4.2		4.8			≠
	PIPA temp	XBAR 255	vdc	▨		▨			
		TES 201	vdc	2.0		3.5			
	IRIG temp	XBAR 156	vdc	▨		▨			
		TES 202	vdc	2.37		3.75			≠
	800 cps 28V Optics	XBAR101	vac	▨		▨			≠
		TES 128	vdc	4.2		4.8			≠
	IRIG temp	XBAR156	vdc	▨		▨			≠
		TES 202	vdc	2.37		3.75			≠
B.18	IMU HEATER current		vdc	▨		▨			
B.19	IMU HEATER current		vdc	3.9		4.8			≠
B.20	IMU BLOWER current		vac	▨		▨			≠
B.21	IMU BLOWER current		vdc	4.0		4.6			≠

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12224
REV C

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.34.a	IG servo error channel 1	Δv	▨		▨		
	IG servo error channel 8	Δv	channel 1 x 0.4		channel 1 x 0.8		
B.34.b	MG servo error channel 2	Δv	▨		▨		
	MG servo error channel 8	Δv	channel 2 x 0.4		channel 2 x 0.8		
B.34.c	OG servo error channel 3	Δv	▨		▨		
	OG servo error channel 8	Δv	channel 3 x 0.4		channel 3 x 0.8		
B.44.a	IG torque motor current channel 6	Δv	▨		▨		
	IG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.b	MG torque motor current channel 6	Δv	▨		▨		
	MG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.c	OG torque motor current channel 6	Δv	▨		▨		
	OG torque motor current channel 8	Δv	channel 6 x 1.8		channel 6 x 3.8		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12224
REV C

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	IG 1X resolver cos (Test a) TES 120	vdc	▨		▨		
B.47.c	IG 1X resolver cos (Test a) XBAR 243	vac	▨		▨		
B.47.b	MG 1X resolver cos (Test b) TES 121	vdc	▨		▨		
B.47.c	MG 1X resolver cos (Test b) XBAR 242	vac	▨		▨		
B.47.b	OG 1X resolver cos (Test c) TES 122	vdc	▨		▨		
B.47.c	OG 1X resolver cos (Test c) XBAR 241	vac	▨		▨		
B.47.b	IG 1X resolver sin (Test d) TES 123	vdc	▨		▨		
B.47.c	IG 1X resolver sin (Test d) XBAR 144	vac	▨		▨		

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FORM 00147
Chg. 8-29-66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC
NO. 12224
REV C

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	MG 1X resolver sin (Test e) TES 124	vdc	▨		▨		
B.47.c	MG 1X resolver sin (Test e) XBAR 143	vac	▨		▨		
B.47.b	OG 1X resolver sin (Test f) TES 125	vdc	▨		▨		
B.47.c	OG 1X resolver sin (Test f) XBAR 142	vac	▨		▨		
B.56	Shaft CDU fine error	vdc	4.35		4.81		
B.62	Trunnion CDU fine error	vdc	4.35		4.81		
B.67	Trunnion CDU DAC output	vdc	4.00		5.00		
B.68	Shaft CDU DAC output	vdc	4.00		5.00		
B.76	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 4.0		channel 1 x 6.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC
NO. 12224
REV C

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.83	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 0.4		channel 1 x 0.6		
B.90	SCA input channel 2	Δv	▨		▨		
	SCA output channel 8	Δv	channel 2 x 4.0		channel 2 x 6.0		
B.98	SCA input channel 5	Δv	▨		▨		
	SCA output channel 8	Δv	channel 5 x 0.4		channel 5 x 0.6		
B.103.a	Roll attitude error (PAVM)	vac	▨		▨		
	Roll attitude error (DVM)	vdc	▨		▨		
B.103.b	Yaw attitude error (PAVM)	vac	▨		▨		
	Yaw attitude error (DVM)	vdc	▨		▨		
B.103.c	Pitch attitude error (PAVM)	vac	▨		▨		
	Pitch attitude error (DVM)	vdc	▨		▨		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 7

JDC
NO. 12224
REV. C

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS	REJ	ACC
B.47	IG 1X resolver cos = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver cos = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver cos = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	IG 1X resolver sin = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver sin = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver sin = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
B.103.a	Roll attitude error = $\frac{2.44\ (\text{SCA output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.b	Yaw attitude error = $\frac{2.44\ (\text{SCA output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.c	Pitch attitude error = $\frac{2.44\ (\text{SCA output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 REV. D PAGE 1 OF 10
INITIAL TDRR 32758 D.S. PGS. 7

SUBSYSTEM BLOCK II G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-
C	9-22-67	34705	1, 2, 4	2	EA	-
D	10-12-67	34827	2, 4, 6, 7, 8	-	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: The items marked (≠) are applicable only for SCA P/N 2007235 and are to be omitted for SCA P/N 2007234.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in cutout above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly 2900919 (observe placarding on bracket assembly for connector locations) and attach with hex nuts supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

3. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3 respectively.

4. Perform JDC 12204 to advance G & N system to STANDBY mode.

5. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Connect PSA Test Point Adapter (TPA-2) direct probes to TB5 jack 26 (high) and TB5 jack 30 (low).

7. Set the Primary Signal Selector VOLTMETER INPUT DVM switch to AUX position.

8. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28 (±0.25) vdc.

NOTE: The 28 vdc bus will cycle with the Heater Cycle.

9. Press to light OPTICS POWER ON pushbutton on Test Control panel.

10. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set
   - (1) OPTICS ZERO to OFF then to ZERO
   - (2) OPTICS TEL TRUN to SLAVE TO SXT
   - (3) OPTICS COUPLING to DIRECT
   - (4) OPTICS MODE to MAN
   - (5) OPTICS SPEED to LO

b. On all Indicator Control Panels except 2021290 set
   - (1) OPTICS MODE to MAN then to ZERO
   - (2) OPTICS CONTROLLER SPEED to LO
   - (3) OPTICS CONTROLLER COUPLING to DIRECT
   - (4) OPTICS TRACKER to OFF
   - (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector Panel Position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record that the CMC lamp on the Indicator Control panel lights and then extinguishes. Record the DVM reading after the CMC lamp has extinguished.

PIPA G/S OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Zero Oscillograph channels 4, 5, and 6 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by offsetting zero line 12 1/2 mm to right of chart centerline.

9. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted.

10. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

11. Obtain Oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I by performing step 9 through 14.

12. Press PROCEED/ISS OPERATE pushbutton on Test Control panel.

NOTE: Do not wait 90 sec. Immediately go to next step.

13. Press IMU CAGE/COMMAND pushbutton.

14. Wait at least 10 seconds for PIPA loop closure, then press PROCEED/ISS STANDBY pushbutton.

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase output
118	Y PIPA G/S in-phase output
119	X PIPA G/S in-phase output

15. Stop Oscillograph. Turn Sensitivity to OFF. Check Oscillograph record for 3 indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5, and 6. Record that traces have centered after loop closure.

POWER SUPPLY AND TEMPERATURE

16. Press PROCEED/ISS OPERATE pushbutton on Test Control panel and wait 90 seconds, for wheel run-up completed, then repeat step A.8.

17. Measure and record the following voltages on the DVM. Measure all the X BAR voltages, then place the Primary Signal Selector to position 271 to measure the corresponding Test Selector panel positions:

Item	Voltage	X Bar	Test Selector Position
a.	120 vdc PIPA supply level	259	103
b.	2.5 vdc TM bias	N/A	104
c.	3200 cps 28V	123	106
d.	800 cps 28V 1% IMU	121	113

Item	Voltage	X Bar	Test Selector Position
≠e.	800 cps 28V 1% Optics	101	128
f.	PIPA temp	255	201
≠g.	IRIG temp	156	202

≠18. Connect TPA-2 direct probes to TB4-21 hi abd TB5-22 lo. Measure and record X BAR 299 voltage on the DVM.

≠19. Set the Test Selector to position 150 and X BAR to 271. Measure and record the DVM indication.

≠20. Connect TPA-2 direct probes to TB4-20 hi and TB5-33 lo. Measure and record X BAR 299 voltage on DVM.

≠21. Set the Test Selector to position 151 and X BAR to 271. Measure and record the DVM indication.

NOTE: In steps 20 and 21, an indication may or may not be present depending upon blower cycling.

IG, MG, AND OG SERVO ERRORS

22. Perform following DSKY operations:

a.	VERB 57		ENTR
b.	Observe		
	VERB 21	NOUN 01	Flashing
c.	00015		ENTR
d.	VERB 41	NOUN 20	ENTR
e.	Observe		
	VERB 21	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe		
	VERB 22	NOUN 22	Flashing
h.	+00000		ENTR
i.	Observe		
	VERB 23	NOUN 22	Flashing
j.	+00000		ENTR

23. Deleted.

24. Connect following signals to Oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error
CHANNEL 2 to 2	MG servo error
CHANNEL 3 to 2	OG servo error
CHANNEL 8 to 4	SCA GDB stepper switch

25. Insure that CH 3 AC indicator is lighted.

26. Zero Oscillograph channels 1, 2, and 3 and set gains at 50 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by offsetting zero line 12 1/2 mm to right of chart centerline.

27. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

28. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X 0.1
FREQUENCY meter to 2

29. Set the Oscillograph Signal Selector Channel 5 to 1 DC. Use the DC BALANCE CONTROL on the Signal Generator to center the trace about zero reference on the Oscillograph.

30. Perform following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

31. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

32. Set the GIMBAL SERVO TEST switch on the Test Selector panel to the appropriate position.

33. Press TEST START pushbutton on Test Selector panel.

34. Obtain an Oscillograph trace of stabilization loop servo error data by increasing the Signal Generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds for each test listed in table II.

Table II

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

35. Stop Oscillograph. Turn SENS to OFF. Record ΔV SCA input signals monitored on channels 1, 2, and 3, and ΔV SCA output signals monitored on channel 8.

IG, MG, AND OG TORQUE MOTOR CURRENTS

#36. Insure that AMPLITUDE control on Signal Generator is set to 0.

#37. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

#38. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

#39. Zero Oscillograph channel 6 and set gain at 0.1 v/cm. Set gain of channel 8 at 1 v/cm and position channel 8 trace as near center as possible with a 2.5 dc bias input.

#40. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

#41. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

#42. To monitor Signal Generator output on Oscillograph set the Oscillograph Signal Selector to channel 5-1 DC.

#43. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

#44. Stop Oscillograph. Record ΔV SCA input signal monitored on channel 6 and ΔV SCA output signal monitored on channel 8.

1X RESOLVER SIN AND COS

45. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe

VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe

VERB 22 NOUN 22 Flashing

e. +04500 ENTR

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

f. Observe

VERB 23 NOUN 22 Flashing

g. +04500 ENTR

46. Wait 20 seconds after performing step 45, then perform following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

NOTE: Due to IMU drift steps 47.b and 47.c must be performed as rapidly as possible for each test listed in table IV.

47. Connect SCA output and SCA input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set CROSSBAR CONTROL switch to 271.

b. Set Test Selector panel to position listed and record DVM indication.

c. Immediately set CROSSBAR CONTROL switch on Primary Signal Selector panel to position listed and record DVM indication.

48. Perform following DSKY operations:

a. Verb 41 NOUN 20 ENTR

b. Observe

VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe

VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 22 Flashing

g. +00000 ENTR

Table IV

Test	Test Selector Panel Position	CROSSBAR CONTROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

SHAFT AND TRUNNION CDU FINE ERROR

49. Deleted.

#50. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

#51. Connect SCA shaft CDU fine error output to DVM by setting Test Selector panel to 146. Set Primary Signal Selector to X BAR 271.

#52. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

#53. Connect SCA shaft CDU fine error input to PAVM by connecting PSA TPA-2 buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low). On Aux Input panel run jumper from Probes output direct to PAVM input, and select PAVM Aux position on Primary Signal Select panel.

#54. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

#54. Set OPTICS MODE switch on Indicator Control Panel to MAN.

#55. Perform following DSKY operations.

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00011 ENTR

#56. Position Optics Hand Controller on Indicator Control panel to the left until the PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

#57. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

#58. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

#59. Connect SCA trunnion CDU fine error output to DVM by setting Test Selector panel to 147. Set Primary Signal Selector to X BAR 271.

#60. Connect SCA trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

#61. Repeat steps 54 and 55.

#62. Position Optics Hand Controller on Indicator Control panel to a down position until PAVM indicates 0.64 VAC in phase. Record SCA output on DVM at CROSSBAR CONTROL position 271.

#63. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

#64. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

#65. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

#66. Perform following DSKY operations:

VERB 21 NOUN 10 ENTR
00012 ENTR
00010 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00012 ENTR

VERB 21 NOUN 01 ENTR
00053 ENTR
77100 ENTR
VERB 21 NOUN 01 ENTR
00054 ENTR
77100 ENTR
VERB 21 NOUN 10 ENTR
00014 ENTR
06000 ENTR

67. Connect SCA trunnion CDU DAC output to DVM by setting Test Selector panel to 126 and Primary Signal Selector X BAR to 271. Record DVM indication.

68. Connect SCA shaft CDU DAC output to DVM by setting Test Selector panel to 127 and Primary Signal Selector X BAR to 271. Record DVM indication.

69. Set OPTICS MODE switch on Indicator Control panel to CMC. After approximately ten seconds, set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO and on all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

#70. Set Test Selector panel to 129.

#71. Connect SCA SXT Shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

#72. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#73. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

#74. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS ZERO switch (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

#75. Hold Optics Hand Controller to left limit not longer than 20 seconds.

#76. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

#77. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph.

#78. Connect SCA SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

#79. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#80. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

#81. Set OPTICS SPEED switch on Indicator Control panel to HI.

#82. Hold Optics Hand Controller to right limit for approximately 20 seconds.

#83. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA

BLOCK II SIGNAL CONDITIONER
JOB FUNCTIONAL CHECKOUT | JDC 12224 REV D PAGE 9 OF 10

SUBSYSTEM BLOCK II G & N SYSTEM | ASSY

SCT shaft tach input and output signals monitored on channels 1 and 8.

✓84. Set Test Selector panel to 130 to connect SCA SXT trunnion tach output to Oscillograph.

✓85. Connect SCA SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

✓86. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

✓87. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

✓88. Set OPTICS SPEED switch on Indicator Control panel to MED.

✓89. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

✓90. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

✓91. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph.

✓92. Connect SCA SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

✓93. Insure that CH 5 AC indicator is lighted.

✓94. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

✓95. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

✓96. Set OPTICS SPEED switch on Indicator Control panel to HI.

✓97. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

✓98. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

✓99. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR

✓100. Perform following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00012		ENTR
c.	00060		ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 101. Ignore lamp indication.

✓101. Perform following DSKY operations:

a.	VERB 43	ENTR

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BLOCK II SIGNAL CONDITIONER
JOB FUNCTIONAL CHECKOUT | JDC 12224 REV D PAGE 10 OF 10

SUBSYSTEM BLOCK II G & N SYSTEM | ASSY

b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+01600		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+01600		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+01600		ENTR

✓102. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM select switch to Aux position on Primary Signal Select panel.

✓103. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA input on PAVM and SCA output on DVM (X BAR 271) for each test.

104. Perform JDC 12204 to turn off G & N system.

105. Perform calculations on data sheets.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

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EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12224
REV D
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME / AFFILIATION APPROVED BY ____ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate		vdc	3.9		4.9		
	28 vdc IMU standby		vdc	3.9		4.9		
	28 vdc optics operate		vdc	3.9		4.9		
B.5	Lamp operation		▨	▨		▨		
	CMC warning		vdc	3.9		4.9		
B.15	Loop closure test 1		▨	▨		▨		
	Loop closure test 2		▨	▨		▨		
	Loop closure test 3		▨	▨		▨		
B.17	120 vdc PIPA Supply	XBAR 259	vdc	▨				
		TES 103	vdc	2.3		4.7		
	2.5 vdc TM Bias TES 104		vdc	2.45		2.55		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
B.17 (cont)	3200 cps 28V	XBAR 123	vac	▨		▨			
		TES 106	vdc	4.2		4.8			
	800 cps 28V IMU	XBAR 121	vac	▨		▨			
		TES 113	vdc	4.2		4.8			
	800 cps 28V Optics	XBAR 101	vac	▨		▨			
		TES 128	vdc	4.2		4.8			✓
	PIPA temp	XBAR 255	vdc	▨		▨			
		TES 201	vdc	2.0		3.5			
	IRIG temp	XBAR 156	vdc	▨		▨			
		TES 202	vdc	2.37		3.75			✓
	800 cps 28V Optics	XBAR 101	vac	▨		▨			✓
		TES 128	vdc	4.2		4.8			✓
	IRIG temp	XBAR 156	vdc	▨		▨			✓
		TES 202	vdc	2.37		3.75			✓
B.18	IMU HEATER current		vdc	▨		▨			
B.19	IMU HEATER current		vdc	3.9		4.8			✓
B.20	IMU BLOWER current		vac	▨		▨			✓
B.21	IMU BLOWER current		vdc	4.0		4.6			✓

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.34.a	IG servo error channel 1	Δv	▨		▨		
	IG servo error channel 8	Δv	channel 1 x 0.4		channel 1 x 0.8		
B.34.b	MG servo error channel 2	Δv	▨		▨		
	MG servo error channel 8	Δv	channel 2 x 0.4		channel 2 x 0.8		
B.34.c	OG servo error channel 3	Δv	▨		▨		
	OG servo error channel 8	Δv	channel 3 x 0.4		channel 3 x 0.8		
B.44.a	IG torque motor current channel 6	Δv	▨		▨		
	IG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.b	MG torque motor current channel 6	Δv	▨		▨		
	MG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.c	OG torque motor current channel 6	Δv	▨		▨		
	OG torque motor current channel 8	Δv	channel 6 x 1.8		channel 6 x 3.8		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	IG 1X resolver cos (Test a) TES 120	vdc	▨		▨		
B.47.c	IG 1X resolver cos (Test a) XBAR 243	vac	▨		▨		
B.47.b	MG 1X resolver cos (Test b) TES 121	vdc	▨		▨		
B.47.c	MG 1X resolver cos (Test b) XBAR 242	vac	▨		▨		
B.47.b	OG 1X resolver cos (Test c) TES 122	vdc	▨		▨		
B.47.c	OG 1X resolver cos (Test c) XBAR 241	vac	▨		▨		
B.47.b	IG 1X resolver sin (Test d) TES 123	vdc	▨		▨		
B.47.c	IG 1X resolver sin (Test d) XBAR 144	vac	▨		▨		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	MG 1X resolver sin (Test e) TES 124	vdc	▨		▨		
B.47.c	MG 1X resolver sin (Test e) XBAR 143	vac	▨		▨		
B.47.b	OG 1X resolver sin (Test f) TES 125	vdc	▨		▨		
B.47.c	OG 1X resolver sin (Test f) XBAR 142	vac	▨		▨		
B.56	Shaft CDU fine error	vdc	4.35		4.81		
B.62	Trunnion CDU fine error	vdc	4.35		4.81		
B.67	Trunnion CDU DAC output	vdc	4.00		5.00		
B.68	Shaft CDU DAC output	vdc	4.00		5.00		
B.76	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 4.0		channel 1 x 6.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.83	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 0.4		channel 1 x 0.6		
B.90	SCA input channel 2	Δv	▨		▨		
	SCA output channel 8	Δv	channel 2 x 4.0		channel 2 x 6.0		
B.98	SCA input channel 5	Δv	▨		▨		
	SCA output channel 8	Δv	channel 5 x 0.4		channel 5 x 0.6		
B.103.a	Roll attitude error (PAVM)	vac	▨		▨		
	Roll attitude error (DVM)	vdc	▨		▨		
B.103.b	Yaw attitude error (PAVM)	vac	▨		▨		
	Yaw attitude error (DVM)	vdc	▨		▨		
B.103.c	Pitch attitude error (PAVM)	vac	▨		▨		
	Pitch attitude error (DVM)	vdc	▨		▨		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS	REJ	ACC
B.47	IG 1X resolver cos = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver cos = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver cos = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	IG 1X resolver sin = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver sin = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver sin = $\frac{8.1\ (\text{SCA output (DVM) (TES)} - 2.5\ \text{vdc bias})}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
B.103.a	Roll attitude error = $\frac{2.44\ (\text{SCA output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.b	Yaw attitude error = $\frac{2.44\ (\text{SCA output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.c	Pitch attitude error = $\frac{2.44\ (\text{SCA output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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INITIAL TDRR 32758 D.S. PGS 7

SUBSYSTEM BLOCK II G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-
C	9-22-67	34705	1, 2, 4	2	EA	-
D	10-12-67	34827	2, 4, 6, 7, 8	-	EA	-
E	11-9-67	35020	1-9	1-3, 5, 7	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: The items marked (≠) are applicable only for SCA P/N 2007235 and are to be omitted for SCA P/N 2007234.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in cutout above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly 2900919 (observe placarding on bracket assembly for connector locations) and attach with hex nuts supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

3. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3 respectively.

4. Perform JDC 12204 to advance system to ISS Operate mode.

5. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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SUBSYSTEM BLOCK II G & N SYSTEM

ASSY

6. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28.8 (±0.25) vdc.

7. Press to light OPTICS POWER ON pushbutton on Test Control panel.

8. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set
   - (1) OPTICS ZERO to OFF then to ZERO
   - (2) OPTICS TEL TRUN to SLAVE TO SXT
   - (3) OPTICS COUPLING to DIRECT
   - (4) OPTICS MODE to MAN
   - (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set
   - (1) OPTICS MODE to MAN then to ZERO
   - (2) OPTICS CONTROLLER SPEED to LO
   - (3) OPTICS CONTROLLER COUPLING to DIRECT
   - (4) OPTICS TRACKER to OFF
   - (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector Panel Position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record that the CMC lamp on the Indicator Control panel lights and then extinguishes. Record the DVM reading after the CMC lamp has extinguished.

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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SUBSYSTEM BLOCK II G & N SYSTEM

ASSY

PIPA G/S OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 mv/mm and set sensitivity of channel 8 to 5 v/cm. Use ZERO ADJ control to center all traces.

9. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	+00000		ENTR
d.	-04500		ENTR
e.	+03500		ENTR

10. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

NOTE: Perform steps 11 through 14 successively for each Test Selector panel position listed in Table I.

11. Set Test Selector panel to position listed in Table I.

12. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all light indications in step 13.

13. Perform the following DSKY operation:

VERB 35 ENTR

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase output
118	Y PIPA G/S in-phase output
119	X PIPA G/S in-phase output

14. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscillograph. Record PIPA loop closure test results as satisfactory if loop closure indication on channel 8 corresponds to loop closure indication on channel 4, 5, or 6.

15. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	+00000		ENTR
c.	-22500		ENTR
d.	-03500		ENTR

16. Repeat steps 11 through 14 then set all Oscillograph Amplifier sensitivities to OFF.

POWER SUPPLY AND TEMPERATURE

17. Measure and record the following voltages by setting CROSSBAR CONTROL on Primary Signal Selector panel to the position indicated and recording the DVM indication and then setting the CROSSBAR CONTROL to 271 to measure the corresponding Test Selector panel positions:

Item	Voltage	CROSSBAR CONTROL	Test Selector
a.	120 vdc PIPA supply level	259	103
b.	2.5 vdc TM bias	N/A	104
c.	3200 cps 28V	123	106
d.	800 cps 28V 1% IMU	121	113

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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SUBSYSTEM BLOCK II G & N SYSTEM

ASSY

≠e.	800 cps 28V 1% Optics	101	128
f.	PIPA temp	255	201
≠g.	IRIG temp	156	202

≠18. Connect TPA-2 direct probes to TB4-21 hi and TB5-22 lo. Measure and record X BAR 299 voltage on the DVM.

≠19. Set the Test Selector to position 150 and X BAR to 271. Measure and record the DVM indication.

≠20. Connect TPA-2 direct probes to TB4-20 hi and TB5-33 lo. Measure and record X BAR 299 voltage on DVM.

≠21. Set the Test Selector to position 151 and X BAR to 271. Measure and record the DVM indication.

NOTE: In steps 20 and 21, an indication may or may not be present depending upon blower cycling.

IG, MG, AND OG SERVO ERRORS

22. Perform following DSKY operations:

a.	VERB 57		ENTR
b.	Observe		
	VERB 21	NOUN 01	Flashing
c.	00015		ENTR
d.	VERB 41	NOUN 20	ENTR
e.	Observe		
	VERB 21	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe		
	VERB 22	NOUN 22	Flashing
h.	+00000		ENTR
i.	Observe		
	VERB 23	NOUN 22	Flashing
j.	+00000		ENTR

23. Deleted.

24. Connect following signals to Oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error
CHANNEL 2 to 2	MG servo error
CHANNEL 3 to 2	OG servo error
CHANNEL 8 to 4	SCA GDB stepper switch

25. Insure that CH 3 AC indicator is lighted.

26. Zero Oscillograph channels 1, 2, and 3 and set gains at 50 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by offsetting zero line 12 1/2 mm to right of chart centerline.

27. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

28. Set switches on Signal Generator as follows:
   - RANGE to X 0.1
   - FREQUENCY meter to 2
   - FUNCTION to SINE
   - AMPLITUDE to zero

29. Set the Oscillograph Signal Selector Channel 5 to 1 DC. Set sensitivity on Oscillograph Amplifier for channel 5 to 20 v/cm. Use the DC BALANCE CONTROL on the Signal Generator to center the trace about zero reference on the Oscillograph.

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30. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

31. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Perform steps 32 through 34 for each test listed in table II.

32. Set GIMBAL SERVO TEST switch on Test Selector panel to position listed in table II.

33. Press TEST START pushbutton on Test Selector panel.

34. Obtain an Oscillograph trace of stabilization loop servo error data by increasing the Signal Generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds.

Table II

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

35. Set GIMBAL SERVO TEST switch on Test Selector panel to OFF. Stop Oscillograph and set sensitivities on Oscillograph Amplifiers to OFF. Record ΔV SCA input signal monitored on channels 1, 2, and 3, and ΔV SCA output signals monitored on channel 8.

IG, MG, AND OG TORQUE MOTOR CURRENTS

≠36. Insure that AMPLITUDE control on Signal Generator is set to 0.

≠37. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

≠38. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

≠39. Zero Oscillograph channel 6 and set gain at 0.1 v/cm. Set gain of channel 8 at 1 v/cm and position channel 8 trace as near center as possible with a 2.5 dc bias input.

≠40. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

≠41. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠42. To monitor Signal Generator output on Oscillograph set the Oscillograph Signal Selector to channel 5-1 DC.

≠43. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

≠44. Set GIMBAL SERVO TEST switch on Test Selector panel to OFF. Stop Oscillograph and set sensitivities on Oscillograph Amplifiers to OFF. Record ΔVSCA input signal monitored on channel 6 and ΔVSCA output signal monitored on channel 8.

1X RESOLVER SIN AND COS

45. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +04500 ENTR

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

f. Observe
VERB 23 NOUN 22 Flashing
g. +04500 ENTR

46. Deleted

47. Connect SCA output and SCA input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set CROSSBAR CONTROL switch to 271.
b. Set Test Selector panel to position listed and record DVM indication.
c. Immediately set CROSSBAR CONTROL switch on Primary Signal Selector panel to position listed and record DVM indication.

48. Perform following DSKY operations:

a. Verb 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

Table IV

Test	Test Selector Panel Position	CROSS-BAR CON-TROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

SHAFT AND TRUNNION CDU FINE ERROR

49. Deleted.

≠50. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠51. Connect SCA shaft CDU fine error output to DVM by setting Test Selector panel to 146. Set Primary Signal Selector to X BAR 271.

≠52. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

≠53. Connect SCA shaft CDU fine error input to PAVM by connecting PSA TPA-2 buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low). On Aux Input panel run jumper from Probes output direct to PAVM input, and select PAVM Aux position on Primary Signal Select panel.

≠54. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

≠54. Set OPTICS MODE switch on Indicator Control Panel to MAN.

≠55. Perform following DSKY operations.

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

≠56. Position Optics Hand Controller on Indicator Control panel to the left until the PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠57. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

≠58. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠59. Connect SCA trunnion CDU fine error output to DVM by setting Test Selector panel to 147. Set Primary Signal Selector to X BAR 271.

≠60. Connect SCA trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

≠61. Repeat steps 54 and 55.

≠62. Position Optics Hand Controller on Indicator Control panel to a down position until PAVM indicates 0.64 VAC in phase. Record SCA output on DVM at CROSSBAR CONTROL position 271.

≠63. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF and set OPTICS MODE switch to CMC. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO for 20 seconds then set to CMC.

≠64. Perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +04500 ENTR
c. +75000 ENTR

≠65. Measure and record SCA Trunnion CDU DAC output on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 271 and setting Test Selector panel to 126.

≠66. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to HI.

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67. Position the Optics Hand Controller to the left to drive shaft in a negative direction until the shaft TPAC indicates 120° ±10°.

68. Set OPTICS MODE switch on Indicator Control panel to CMC. Measure and record SCA Shaft CDU DAC output on DVM by setting CROSSBAR CONTROL on Primary Signal Selector to 271 and setting Test Selector panel to 127.

69. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

≠70. Set Test Selector panel to 129.

≠71. Connect SCA SXT Shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

≠72. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠73. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

≠74. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS ZERO switch (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

≠75. Hold Optics Hand Controller to left limit not longer than 20 seconds.

≠76. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

≠77. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph.

≠78. Connect SCA SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

≠79. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠80. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠81. Set OPTICS SPEED switch on Indicator Control panel to HI.

≠82. Hold Optics Hand Controller to right limit for approximately 20 seconds.

≠83. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

#85. Connect SCA SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

#86. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#87. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

#88. Set OPTICS SPEED switch on Indicator Control panel to MED.

#89. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

#90. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

#91. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph.

#92. Connect SCA SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

#93. Insure that CH 5 AC indicator is lighted.

#94. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#95. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

#96. Set OPTICS SPEED switch on Indicator Control panel to HI.

#97. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

#98. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set sensitivities on Oscillograph Amplifiers to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

#99. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

#100. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 101. Ignore lamp indication.

---

b. Observe
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

#102. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM select switch to Aux position on Primary Signal Select panel.

#103. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA input on PAVM and SCA output on DVM (X BAR 271) for each test.

104. Perform JDC 12204 to turn off G & N system.

105. Perform calculations on data sheets.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12224
REV E
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate	vdc	3.9		4.9		
	28 vdc IMU standby	vdc	3.9		4.9		
	28 vdc optics operate	vdc	3.9		4.9		
B.5	Lamp operation	▨	▨		▨		
	CMC warning	vdc	3.9		4.9		
B.14	Loop closure test 1	▨	▨		▨		
	Loop closure test 2	▨	▨		▨		
	Loop closure test 3	▨	▨		▨		
B.16 (B.14)	Loop closure test 1 Loop closure test 2 Loop closure test 3	▨	▨		▨		
B.17.a	120 vdc XBAR 259	vdc	▨		▨		
	PIPA TES 103 Supply	vdc	2.3		4.7		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12224
REV E

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.17.b	2.5 vdc TM Bias TES 104		vdc	2.45		2.55		
B.17.c	3200 cps 28V	XBAR 123	vac	▨		▨		
		TES 106	vdc	4.2		4.8		
B.17.d	800 cps 28V 1% IMU	XBAR 121	vac	▨		▨		
		TES 113	vdc	4.2		4.8		
B.17.e	800 cps 28V 1% Optics	XBAR 101	vac	▨		▨		
		TES 128	vdc	4.2		4.8		
B.17.f	PIPA temp	XBAR 255	vdc	▨		▨		
		TES 201	vdc	2.0		3.5		
B.17.g	IRIG temp	XBAR 156	vdc	▨		▨		
		TES 202	vdc	2.37		3.75		
B.18	IMU HEATER current		vdc	▨		▨		
B.19	IMU HEATER current		vdc	3.9		4.8		
B.20	IMU BLOWER current		vac	▨		▨		
B.21	IMU BLOWER current		vdc	4.0		4.6		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12224
REV E

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.34.a	IG servo error channel 1	Δv	▨		▨		
	IG servo error channel 8	Δv	channel 1 x 0.4		channel 1 x 0.8		
B.34.b	MG servo error channel 2	Δv	▨		▨		
	MG servo error channel 8	Δv	channel 2 x 0.4		channel 2 x 0.8		
B.34.c	OG servo error channel 3	Δv	▨		▨		
	OG servo error channel 8	Δv	channel 3 x 0.4		channel 3 x 0.8		
B.44.a	IG torque motor current channel 6	Δv	▨		▨		
	IG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.b	MG torque motor current channel 6	Δv	▨		▨		
	MG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.c	OG torque motor current channel 6	Δv	▨		▨		
	OG torque motor current channel 8	Δv	channel 6 x 1.8		channel 6 x 3.8		

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EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12224
REV E

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	IG 1X resolver cos (Test a) TES 120	vdc	▨		▨		
B.47.c	IG 1X resolver cos (Test a) XBAR 243	vac	▨		▨		
B.47.b	MG 1X resolver cos (Test b) TES 121	vdc	▨		▨		
B.47.c	MG 1X resolver cos (Test b) XBAR 242	vac	▨		▨		
B.47.b	OG 1X resolver cos (Test c) TES 122	vdc	▨		▨		
B.47.c	OG 1X resolver cos (Test c) XBAR 241	vac	▨		▨		
B.47.b	IG 1X resolver sin (Test d) TES 123	vdc	▨		▨		
B.47.c	IG 1X resolver sin (Test d) XBAR 144	vac	▨		▨		

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EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC
NO. 12224
REV E

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	MG 1X resolver sin (Test e) TES 124	vdc	▨		▨		
B.47.c	MG 1X resolver sin (Test e) XBAR 143	vac	▨		▨		
B.47.b	OG 1X resolver sin (Test f) TES 125	vdc	▨		▨		
B.47.c	OG 1X resolver sin (Test f) XBAR 142	vac	▨		▨		
B.56	Shaft CDU fine error	vdc	4.35		4.81		
B.62	Trunnion CDU fine error	vdc	4.35		4.81		
B.65	Trunnion CDU DAC output	vdc	4.00		5.00		
B.68	Shaft CDU DAC output	vdc	4.00		5.00		
B.76	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 4.0		channel 1 x 6.0		

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EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC
NO. 12224
REV E

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.83	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 0.4		channel 1 x 0.6		
B.90	SCA input channel 2	Δv	▨		▨		
	SCA output channel 8	Δv	channel 2 x 4.0		channel 2 x 6.0		
B.98	SCA input channel 5	Δv	▨		▨		
	SCA output channel 8	Δv	channel 5 x 0.4		channel 5 x 0.6		
B.103.a	Roll attitude error (PAVM)	vac	▨		▨		
	Roll attitude error (DVM)	vdc	▨		▨		
B.103.b	Yaw attitude error (PAVM)	vac	▨		▨		
	Yaw attitude error (DVM)	vdc	▨		▨		
B.103.c	Pitch attitude error (PAVM)	vac	▨		▨		
	Pitch attitude error (DVM)	vdc	▨		▨		

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EQUIPMENT TEST
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JDC
NO. 12224
REV E

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS	REJ	ACC
B.47	IG 1X resolver cos = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver cos = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver cos = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	IG 1X resolver sin = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver sin = $\frac{8.1\left[\text{SCA output(DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver sin = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
B.103.a	Roll attitude error = $\frac{2.44\left[\text{SCA output (DVM)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.b	Yaw attitude error = $\frac{2.44\left[\text{SCA output (DVM)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.c	Pitch attitude error = $\frac{2.44\left[\text{SCA output (DVM)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT | **JDC** 12224 **REV.** F **PAGE** 1 **OF** 10
INITIAL TDRR 32758 **D.S. PGS.** 7

SUBSYSTEM BLOCK II G & N SYSTEM | **ASSY.**

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-
C	9-22-67	34705	1, 2, 4	2	EA	-
D	10-12-67	34827	2, 4, 6, 7, 8	-	EA	-
E	11-9-67	35020	1-9	1-3, 5, 7	EA	-
F	1-16-68	35449	7	-	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops

INTERVAL

TOOLS AND MATERIAL

NOTE: The items marked (≠) are applicable only for SCA P/N 2007235 and are to be omitted for SCA P/N 2007234.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in cutout above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly 2900919 (observe placarding on bracket assembly for connector locations) and attach with hex nuts supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

3. Connect GNF harness connectors P7 P8, and P9 to SCA connectors J2, J1, and J3 respectively.

4. Perform JDC 12204 to advance system to ISS Operate mode.

5. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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6. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28.8 (±0.25) vdc.

7. Press to light OPTICS POWER ON pushbutton on Test Control panel.

8. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set
   - (1) OPTICS ZERO to OFF then to ZERO
   - (2) OPTICS TEL TRUN to SLAVE TO SXT
   - (3) OPTICS COUPLING to DIRECT
   - (4) OPTICS MODE to MAN
   - (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set
   - (1) OPTICS MODE to MAN then to ZERO
   - (2) OPTICS CONTROLLER SPEED to LO
   - (3) OPTICS CONTROLLER COUPLING to DIRECT
   - (4) OPTICS TRACKER to OFF
   - (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector Panel Position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record that the CMC lamp on the Indicator Control panel lights and then extinguishes. Record the DVM reading after the CMC lamp has extinguished.

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PIPA G/S OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 mv/mm and set sensitivity of channel 8 to 5 v/cm. Use ZERO ADJ control to center all traces.

9. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	+00000		ENTR
d.	-04500		ENTR
e.	+03500		ENTR

10. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

NOTE: Perform steps 11 through 14 successively for each Test Selector panel position listed in Table I.

11. Set Test Selector panel to position listed in Table I.

12. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all light indications in step 13.

13. Perform the following DSKY operation:
VERB 35 ENTR

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase output
118	Y PIPA G/S in-phase output
119	X PIPA G/S in-phase output

14. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscillograph. Record PIPA loop closure test results as satisfactory if loop closure indication on channel 8 corresponds to loop closure indication on channel 4, 5, or 6.

15. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	+00000		ENTR
c.	-22500		ENTR
d.	-03500		ENTR

16. Repeat steps 11 through 14 then set all Oscillograph Amplifier sensitivities to OFF.

POWER SUPPLY AND TEMPERATURE

17. Measure and record the following voltages by setting CROSSBAR CONTROL on Primary Signal Selector panel to the position indicated and recording the DVM indication and then setting the CROSSBAR CONTROL to 271 to measure the corresponding Test Selector panel positions:

Item	Voltage	CROSSBAR CONTROL	Test Selector
a.	120 vdc PIPA supply level	259	103
b.	2.5 vdc TM bias	N/A	104
c.	3200 cps 28V	123	106
d.	800 cps 28V 1% IMU	121	113

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≠e.	800 cps 28V 1% Optics	101	128
f.	PIPA temp	255	201
≠g.	IRIG temp	156	202

≠18. Connect TPA-2 direct probes to TB4-21 hi and TB5-22 lo. Measure and record X BAR 299 voltage on the DVM.

≠19. Set the Test Selector to position 150 and X BAR to 271. Measure and record the DVM indication.

≠20. Connect TPA-2 direct probes to TB4-20 hi and TB5-33 lo. Measure and record X BAR 299 voltage on DVM.

≠21. Set the Test Selector to position 151 and X BAR to 271. Measure and record the DVM indication.

NOTE: In steps 20 and 21, an indication may or may not be present depending upon blower cycling.

IG, MG, AND OG SERVO ERRORS

22. Perform following DSKY operations:

a.	VERB 57		ENTR
b.	Observe		
	VERB 21	NOUN 01	Flashing
c.	00015		ENTR
d.	VERB 41	NOUN 20	ENTR
e.	Observe		
	VERB 21	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe		
	VERB 22	NOUN 22	Flashing
h.	+00000		ENTR
i.	Observe		
	VERB 23	NOUN 22	Flashing
j.	+00000		ENTR

23. Deleted.

24. Connect following signals to Oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error
CHANNEL 2 to 2	MG servo error
CHANNEL 3 to 2	OG servo error
CHANNEL 8 to 4	SCA GDB stepper switch

25. Insure that CH 3 AC indicator is lighted.

26. Zero Oscillograph channels 1, 2, and 3 and set gains at 50 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by offsetting zero line 12 1/2 mm to right of chart centerline.

27. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

28. Set switches on Signal Generator as follows:
RANGE to X 0.1
FREQUENCY meter to 2
FUNCTION to SINE
AMPLITUDE to zero

29. Set the Oscillograph Signal Selector Channel 5 to 1 DC. Set sensitivity on Oscillograph Amplifier for channel 5 to 20 v/cm. Use the DC BALANCE CONTROL on the Signal Generator to center the trace about zero reference on the Oscillograph.

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30. Perform following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

31. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Perform steps 32 through 34 for each test listed in table II.

32. Set GIMBAL SERVO TEST switch on Test Selector panel to position listed in table II.

33. Press TEST START pushbutton on Test Selector panel.

34. Obtain an Oscillograph trace of stabilization loop servo error data by increasing the Signal Generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds.

Table II

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

35. Set GIMBAL SERVO TEST switch on Test Selector panel to OFF. Stop Oscillograph and set sensitivities on Oscillograph Amplifiers to OFF. Record ΔV SCA input signal monitored on channels 1, 2, and 3, and ΔV SCA output signals monitored on channel 8.

IG, MG, AND OG TORQUE MOTOR CURRENTS

≠36. Insure that AMPLITUDE control on Signal Generator is set to 0.

≠37. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

≠38. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

≠39. Zero Oscillograph channel 6 and set gain at 0.1 v/cm. Set gain of channel 8 at 1 v/cm and position channel 8 trace as near center as possible with a 2.5 dc bias input.

≠40. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

≠41. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠42. To monitor Signal Generator output on Oscillograph set the Oscillograph Signal Selector to channel 5-1 DC.

≠43. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

≠44. Set GIMBAL SERVO TEST switch on Test Selector panel to OFF. Stop Oscillograph and set sensitivities on Oscillograph Amplifiers to OFF. Record ΔV SCA input signal monitored on channel 6 and ΔV SCA output signal monitored on channel 8.

1X RESOLVER SIN AND COS

45. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. +04500 ENTR

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

f. Observe
VERB 23 NOUN 22 Flashing

g. +04500 ENTR

46. Deleted

47. Connect SCA output and SCA input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set CROSSBAR CONTROL switch to 271.

b. Set Test Selector panel to position listed and record DVM indication.

c. Immediately set CROSSBAR CONTROL switch on Primary Signal Selector panel to position listed and record DVM indication.

48. Perform following DSKY operations:

a. Verb 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. +00000 ENTR

Table IV

Test	Test Selector Panel Position	CROSSBAR CONTROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

SHAFT AND TRUNNION CDU FINE ERROR

49. Deleted.

≠50. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠51. Connect SCA shaft CDU fine error output to DVM by setting Test Selector panel to 146. Set Primary Signal Selector to X BAR 271.

≠52. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

≠53. Connect SCA shaft CDU fine error input to PAVM by connecting PSA TPA-2 buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low). On Aux Input panel run jumper from Probes output direct to PAVM input, and select PAVM Aux position on Primary Signal Select panel.

≠54. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and SET OPTICS MODE switch to MAN.

≠55. Perform following DSKY operations.

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00011 ENTR

≠56. Position Optics Hand Controller on Indicator Control panel to the left until the PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠57. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

≠58. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠59. Connect SCA trunnion CDU fine error output to DVM by setting Test Selector panel to 147. Set Primary Signal Selector to X BAR 271.

≠60. Connect SCA trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

≠61. Repeat steps 54 and 55.

≠62. Position Optics Hand Controller on Indicator Control panel to a down position until PAVM indicates 0.64 VAC in phase. Record SCA output on DVM at CROSSBAR CONTROL position 271.

63. Set OPTICS ZERO switch on Indicator Control panel 2021290 to OFF, then to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF and set OPTICS MODE switch to CMC. On all Indicator Control panels except 2021290 set OPTICS MODE switch to MAN, then to ZERO for 20 seconds, then set to CMC.

64. Perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR

b. +04500 ENTR

c. +75000 ENTR

65. Measure and record SCA Trunnion CDU DAC output on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 271 and setting Test Selector panel to 126.

66. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to HI.

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67. Position the Optics Hand Controller to the left to drive shaft in a negative direction until the shaft TPAC indicates 120° ±10°.

68. Set OPTICS MODE switch on Indicator Control panel to CMC. Measure and record SCA Shaft CDU DAC output on DVM by setting CROSSBAR CONTROL on Primary Signal Selector to 271 and setting Test Selector panel to 127.

69. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

≠70. Set Test Selector panel to 129.

≠71. Connect SCA SXT Shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

≠72. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠73. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

≠74. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS ZERO switch (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

≠75. Hold Optics Hand Controller to left limit not longer than 20 seconds.

≠76. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

≠77. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph.

≠78. Connect SCA SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

≠79. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠80. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠81. Set OPTICS SPEED switch on Indicator Control panel to HI.

≠82. Hold Optics Hand Controller to right limit for approximately 20 seconds.

≠83. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

#85. Connect SCA SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

#86. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#87. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

#88. Set OPTICS SPEED switch on Indicator Control panel to MED.

#89. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

#90. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

#91. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph.

#92. Connect SCA SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

#93. Insure that CH 5 AC indicator is lighted.

#94. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#95. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

#96. Set OPTICS SPEED switch on Indicator Control panel to HI.

#97. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

#98. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set sensitivities on Oscillograph Amplifiers to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

#99. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

#100. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 101. Ignore lamp indication.

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b. Observe
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

#102. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM select switch to Aux position on Primary Signal Select panel.

#103. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA input on PAVM and SCA output on DVM (X BAR 271) for each test.

104. Perform JDC 12204 to turn off G & N system.

105. Perform calculations on data sheets.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

NO. 12224 JDC
REV F
INITIAL TDRR 32759

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate	vdc	3.9		4.9		
	28 vdc IMU standby	vdc	3.9		4.9		
	28 vdc optics operate	vdc	3.9		4.9		
B.5	Lamp operation	▨	▨		▨		
	CMC warning	vdc	3.9		4.9		
B.14	Loop closure test 1	▨	▨		▨		
	Loop closure test 2	▨	▨		▨		
	Loop closure test 3	▨	▨		▨		
B.16 (B.14)	Loop closure test 1 Loop closure test 2 Loop closure test 3	▨	▨		▨		
B.17.a	120 vdc XBAR 259	vdc	▨		▨		
	PIPA TES 103 Supply	vdc	2.3		4.7		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12224
REV F

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.17.b	2.5 vdc TM Bias TES 104		vdc	2.45		2.55		
B.17.c	3200 cps 28V	XBAR 123	vac	▨		▨		
		TES 106	vdc	4.2		4.8		
B.17.d	800 cps 28V 1% IMU	XBAR 121	vac	▨		▨		
		TES 113	vdc	4.2		4.8		
B.17.e	800 cps 28V 1% Optics	XBAR 101	vac	▨		▨		
		TES 128	vdc	4.2		4.8		
B.17.f	PIPA temp	XBAR 255	vdc	▨		▨		
		TES 201	vdc	2.0		3.5		
B.17.g	IRIG temp	XBAR 156	vdc	▨		▨		
		TES 202	vdc	2.37		3.75		
B.18	IMU HEATER current		vdc	▨		▨		
B.19	IMU HEATER current		vdc	3.9		4.8		
B.20	IMU BLOWER current		vac	▨		▨		
B.21	IMU BLOWER current		vdc	4.0		4.6		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 7

JDC
NO. 12224
REV. F

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.34.a	IG servo error channel 1	Δv	▨		▨		
	IG servo error channel 8	Δv	channel 1 x 0.4		channel 1 x 0.8		
B.34.b	MG servo error channel 2	Δv	▨		▨		
	MG servo error channel 8	Δv	channel 2 x 0.4		channel 2 x 0.8		
B.34.c	OG servo error channel 3	Δv	▨		▨		
	OG servo error channel 8	Δv	channel 3 x 0.4		channel 3 x 0.8		
B.44.a	IG torque motor current channel 6	Δv	▨		▨		
	IG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.b	MG torque motor current channel 6	Δv	▨		▨		
	MG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.c	OG torque motor current channel 6	Δv	▨		▨		
	OG torque motor current channel 8	Δv	channel 6 x 1.8		channel 6 x 3.8		

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EQUIPMENT TEST
DATA SHEET 4 **OF** 7

JDC
NO. 12224
REV. F

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	IG 1X resolver cos (Test a) TES 120	vdc	▨		▨		
B.47.c	IG 1X resolver cos (Test a) XBAR 243	vac	▨		▨		
B.47.b	MG 1X resolver cos (Test b) TES 121	vdc	▨		▨		
B.47.c	MG 1X resolver cos (Test b) XBAR 242	vac	▨		▨		
B.47.b	OG 1X resolver cos (Test c) TES 122	vdc	▨		▨		
B.47.c	OG 1X resolver cos (Test c) XBAR 241	vac	▨		▨		
B.47.b	IG 1X resolver sin (Test d) TES 123	vdc	▨		▨		
B.47.c	IG 1X resolver sin (Test d) XBAR 144	vac	▨		▨		

DATE 26 JAN 67

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EQUIPMENT TEST
DATA SHEET 5 **OF** 7

JDC
NO. 12224
REV. F

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	MG 1X resolver sin (Test e) TES 124	vdc	▨		▨		
B.47.c	MG 1X resolver sin (Test e) XBAR 143	vac	▨		▨		
B.47.b	OG 1X resolver sin (Test f) TES 125	vdc	▨		▨		
B.47.c	OG 1X resolver sin (Test f) XBAR 142	vac	▨		▨		
B.56	Shaft CDU fine error	vdc	4.35		4.81		
B.62	Trunnion CDU fine error	vdc	4.35		4.81		
B.65	Trunnion CDU DAC output	vdc	4.00		5.00		
B.68	Shaft CDU DAC output	vdc	4.00		5.00		
B.76	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 4.0		channel 1 x 6.0		

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EQUIPMENT TEST
DATA SHEET 6 **OF** 7

JDC
NO. 12224
REV. F

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.83	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 0.4		channel 1 x 0.6		
B.90	SCA input channel 2	Δv	▨		▨		
	SCA output channel 8	Δv	channel 2 x 4.0		channel 2 x 6.0		
B.98	SCA input channel 5	Δv	▨		▨		
	SCA output channel 8	Δv	channel 5 x 0.4		channel 5 x 0.6		
B.103.a	Roll attitude error (PAVM)	vac	▨		▨		
	Roll attitude error (DVM)	vdc	▨		▨		
B.103.b	Yaw attitude error (PAVM)	vac	▨		▨		
	Yaw attitude error (DVM)	vdc	▨		▨		
B.103.c	Pitch attitude error (PAVM)	vac	▨		▨		
	Pitch attitude error (DVM)	vdc	▨		▨		

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EQUIPMENT TEST
DATA SHEET 7 **OF** 7

JDC
NO. 12224
REV. F

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS	REJ	ACC
B.47	IG 1X resolver cos = $\frac{8.1\,[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver cos = $\frac{8.1\,[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver cos = $\frac{8.1\,[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	IG 1X resolver sin = $\frac{8.1\,[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver sin = $\frac{8.1\,[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver sin = $\frac{8.1\,[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
B.103.a	Roll attitude error = $\frac{2.44\,[\text{SCA output (DVM)} - 2.5\text{ vdc bias}]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.b	Yaw attitude error = $\frac{2.44\,[\text{SCA output (DVM)} - 2.5\text{ vdc bias}]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.c	Pitch attitude error = $\frac{2.44\,[\text{SCA output (DVM)} - 2.5\text{ vdc bias}]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 REV. G PAGE 1 OF 10
INITIAL TDRR 32758 D.S. PGS 7

SUBSYSTEM BLOCK II G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-
C	9-22-67	34705	1, 2, 4	2	EA	-
D	10-12-67	34827	2, 4, 6, 7, 8	-	EA	-
E	11-9-67	35020	1-9	1-3, 5, 7	EA	-
F	1-16-68	35449	7	-	EA	-
G	4-5-68	36040	4, 5	3, 7	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT Avoid repeated slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: The items marked (≠) are applicable only for SCA P/N 2007235 and are to be omitted for SCA P/N 2007234.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in cutout above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly 2900919 (observe placarding on bracket assembly for connector locations) and attach with hex nuts supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

3. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3 respectively.

4. Perform JDC 12204 to advance system to ISS Operate mode.

5. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

6. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28.8 (±0.25) vdc.

7. Press to light OPTICS POWER ON pushbutton on Test Control panel.

8. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set
   - (1) OPTICS ZERO to OFF then to ZERO
   - (2) OPTICS TEL TRUN to SLAVE TO SXT
   - (3) OPTICS COUPLING to DIRECT
   - (4) OPTICS MODE to MAN
   - (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set
   - (1) OPTICS MODE to MAN then to ZERO
   - (2) OPTICS CONTROLLER SPEED to LO
   - (3) OPTICS CONTROLLER COUPLING to DIRECT
   - (4) OPTICS TRACKER to OFF
   - (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector Panel Position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record that the CMC lamp on the Indicator Control panel lights and then extinguishes. Record the DVM reading after the CMC lamp has extinguished.

PIPA G/S OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 mv/mm and set sensitivity of channel 8 to 5 v/cm. Use ZERO ADJ control to center all traces.

9. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	+00000		ENTR
d.	-04500		ENTR
e.	+03500		ENTR

10. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

NOTE: Perform steps 11 through 14 successively for each Test Selector panel position listed in Table I.

11. Set Test Selector panel to position listed in Table I.

12. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all light indications in step 13.

13. Perform the following DSKY operation:

VERB 35	ENTR

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase output
118	Y PIPA G/S in-phase output
119	X PIPA G/S in-phase output

14. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscillograph. Record PIPA loop closure test results as satisfactory if loop closure indication on channel 8 corresponds to loop closure indication on channel 4, 5, or 6.

15. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	+00000		ENTR
c.	-22500		ENTR
d.	-03500		ENTR

16. Repeat steps 11 through 14 then set all Oscillograph Amplifier sensitivities to OFF.

POWER SUPPLY AND TEMPERATURE

17. Measure and record the following voltages by setting CROSSBAR CONTROL on Primary Signal Selector panel to the position indicated and recording the DVM indication and then setting the CROSSBAR CONTROL to 271 to measure the corresponding Test Selector panel positions:

Item	Voltage	CROSSBAR CONTROL	Test Selector
a.	120 vdc PIPA supply level	259	103
b.	2.5 vdc TM bias	N/A	104
c.	3200 cps 28V	123	106
d.	800 cps 28V 1% IMU	121	113

≠e.	800 cps 28V 1% Optics	101	128
f.	PIPA temp	255	201
≠g.	IRIG temp	156	202

NOTE: The SCM TEST TMC INHIBIT lamp on the Temperature Monitor Control panel will light whenever PIPA or IRIG temperature monitor is selected. Ignore lamp indication.

≠18. Connect TPA-2 direct probes to TB4-21 hi and TB5-22 lo. Measure and record X BAR 299 voltage on the DVM.

≠19. Set the Test Selector to position 150 and X BAR to 271. Measure and record the DVM indication.

≠20. Connect TPA-2 direct probes to TB4-20 hi and TB5-33 lo. Measure and record X BAR 299 voltage on DVM.

≠21. Set the Test Selector to position 151 and X BAR to 271. Measure and record the DVM indication.

NOTE: In steps 20 and 21, an indication may or may not be present depending upon blower cycling.

IG, MG, AND OG SERVO ERRORS

22. Perform following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	Observe:		
	VERB 21	NOUN 22	Flashing
d.	+00000		ENTR
e.	Observe:		
	VERB 22	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe:		
	VERB 23	NOUN 22	Flashing
h.	+00000		ENTR

23. Set switches on Signal Generator as follows:

RANGE to X 0.1
FREQUENCY meter to 4
FUNCTION to SQUARE
DC BALANCE to mid position
AMPLITUDE to 70

24. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

25. Set FUNCTION control on PAVM to 0° and set FREQUENCY control to 3200 ~.

26. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

27. Obtain stabilization loop servo error SCA input and output data on PAVM and DVM for each test listed in table II. For each test, perform following operations:

a. Set CROSSBAR CONTROL on Primary Signal Selector panel to position listed.

b. Set GIMBAL SERVO TEST switch on Test Selector panel to position listed.

c. Set Test Selector panel to position listed.

d. Press to light TEST START pushbutton on Test Selector panel.

Table II

Test	CROSSBAR CONTROL Position (PAVM)	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position (DVM)	Signal
a	135	1	137	IG servo error
b	134	2	138	MG servo error
c	133	3	139	OG servo error

NOTE: The SCA input voltage will cause the PAVM to alternately deflect to the left and right. Determine the maximum deflection in each direction. Add the absolute values to determine maximum meter spread.

e. Record maximum meter spread of SCA input voltage on PAVM.

f. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high and low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.

g. Record maximum meter spread of SCA output voltage on DVM.

h. Press TEST STOP pushbutton on Test Selector panel. The pushbutton shall go out.

28. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall go out.

29 through 35. Deleted.

IG, MG, AND OG TORQUE MOTOR CURRENTS

≠36. Insure that AMPLITUDE control on Signal Generator is set to 0.

≠37. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

≠38. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

≠39. Zero Oscillograph channel 6 and set gain at 0.1 v/cm. Set gain of channel 8 at 1 v/cm and position channel 8 trace as near center as possible with a 2.5 dc bias input.

≠40. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

≠41. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠42. To monitor Signal Generator output on Oscillograph set the Oscillograph Signal Selector to channel 5-1 DC.

≠43. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

≠44. Set GIMBAL SERVO TEST switch on Test Selector panel to OFF. Stop Oscillograph and set sensitivities on Oscillograph Amplifiers to OFF. Record Δ V SCA input signal monitored on channel 6 and Δ V SCA output signal monitored on channel 8.

1X RESOLVER SIN AND COS

45. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +04500 ENTR

46. Deleted

47. Connect SCA output and SCA input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set CROSSBAR CONTROL switch to 271.
b. Set Test Selector panel to position listed and record DVM indication.
c. Immediately set CROSSBAR CONTROL switch on Primary Signal Selector panel to position listed and record DVM indication.

48. Perform following DSKY operations:

a. Verb 41 NOUN 20 ENTR

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

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b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

Table IV

Test	Test Selector Panel Position	CROSSBAR CONTROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

SHAFT AND TRUNNION CDU FINE ERROR

49. Deleted.

≠50. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠51. Connect SCA shaft CDU fine error output to DVM by setting Test Selector panel to 146. Set Primary Signal Selector to X BAR 271.

≠52. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

≠53. Connect SCA shaft CDU fine error input to PAVM by connecting PSA TPA-2 buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low). On Aux Input panel run jumper from Probes output direct to PAVM input, and select PAVM Aux position on Primary Signal Select panel.

≠54. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and SET OPTICS MODE switch to MAN.

≠55. Perform following DSKY operations.

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

≠56. Position Optics Hand Controller on Indicator Control panel to the left until the PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠57. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

≠58. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠59. Connect SCA trunnion CDU fine error output to DVM by setting Test Selector panel to 147. Set Primary Signal Selector to X BAR 271.

≠60. Connect SCA trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

≠61. Repeat steps 54 and 55.

≠62. Position Optics Hand Controller on Indicator Control panel to a down position until PAVM indicates 0.64 VAC in phase. Record SCA output on DVM at CROSSBAR CONTROL position 271.

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63. Set OPTICS ZERO switch on Indicator Control panel 2021290 to OFF, then to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF and set OPTICS MODE switch to CMC. On all Indicator Control panels except 2021290 set OPTICS MODE switch to MAN, then to ZERO for 20 seconds, then set to CMC.

64. Perform the following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +04500 ENTR
c. +75000 ENTR

65. Measure and record SCA Trunnion CDU DAC output on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 271 and setting Test Selector panel to 126.

66. Set OPTICS MODE switch on Indicator Control panel to MAN and set OPTICS SPEED switch to HI.

67. Position the Optics Hand Controller to the left to drive shaft in a negative direction until the shaft TPAC indicates 120° ±10°.

68. Set OPTICS MODE switch on Indicator Control panel to CMC. Measure and record SCA Shaft CDU DAC output on DVM by setting CROSSBAR CONTROL on Primary Signal Selector to 271 and setting Test Selector panel to 127.

69. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

≠70. Set Test Selector panel to 129.

≠71. Connect SCA SXT Shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

≠72. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

≠73. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

≠74. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS ZERO switch (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

≠75. Hold Optics Hand Controller to left limit not longer than 20 seconds.

≠76. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

≠77. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph.

≠78. Connect SCA SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

#79. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#80. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

#81. Set OPTICS SPEED switch on Indicator Control panel to HI.

#82. Hold Optics Hand Controller to right limit for approximately 20 seconds.

#83. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

#84. Set Test Selector panel to 130 to connect SCA SXT trunnion tach output to Oscillograph.

#85. Connect SCA SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

#86. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#87. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

#88. Set OPTICS SPEED switch on Indicator Control panel to MED.

#89. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

#90. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

#91. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph.

#92. Connect SCA SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

#93. Insure that CH 8 AC indicator is lighted.

#94. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

#95. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

#96. Set OPTICS SPEED switch on Indicator Control panel to HI.

#97. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

#98. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set sensitivities on Oscillograph Amplifiers to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

#99. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing

---

g. +00000 ENTR

#100. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 101. Ignore lamp indication.

#101. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

#102. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM select switch to Aux position on Primary Signal Select panel.

#103. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA input on PAVM and SCA output on DVM (X BAR 271) for each test.

104. Perform JDC 12204 to turn off G & N system.

105. Perform calculations on data sheets.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12224
REV G
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE ____________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ______ CAL DATE ______
NAME ____________ SER. NO. ______ CAL DATE ______

CONDUCTED BY ____________ NAME/AFFILIATION APPROVED BY ____________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate	vdc	3.9		4.9		
	28 vdc IMU standby	vdc	3.9		4.9		
	28 vdc optics operate	vdc	3.9		4.9		
B.5	Lamp operation	▨	▨		▨		
	CMC warning	vdc	3.9		4.9		
B.14	Loop closure test 1	▨	▨		▨		
	Loop closure test 2	▨	▨		▨		
	Loop closure test 3	▨	▨		▨		
B.16 (B.14)	Loop closure test 1 Loop closure test 2 Loop closure test 3	▨	▨		▨		
B.17.a	120 vdc XBAR 259	vdc	▨		▨		
	PIPA TES 103 Supply	vdc	2.3		4.7		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC NO. 12224
REV G

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.17.b	2.5 vdc TM Bias TES 104		vdc	2.45		2.55		
B.17.c	3200 cps 28V	XBAR 123	vac	▨		▨		
		TES 106	vdc	4.2		4.8		
B.17.d	800 cps 28V 1% IMU	XBAR 121	vac	▨		▨		
		TES 113	vdc	4.2		4.8		
B.17.e	800 cps 28V 1% Optics	XBAR 101	vac	▨		▨		
		TES 128	vdc	4.2		4.8		
B.17.f	PIPA temp	XBAR 255	vdc	▨		▨		
		TES 201	vdc	2.0		3.5		
B.17.g	IRIG temp	XBAR 156	vdc	▨		▨		
		TES 202	vdc	2.37		3.75		
B.18	IMU HEATER current		vdc	▨		▨		
B.19	IMU HEATER current		vdc	3.9		4.8		
B.20	IMU BLOWER current		vac	▨		▨		
B.21	IMU BLOWER current		vdc	4.0		4.6		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12224
REV G

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.27.e	IG servo error meter spread (PAVM) (Test a)	VAC	▨		▨		
B.27.g	IG servo error meter spread (DVM) (Test a)	VDC	▨		▨		
B.27.e	MG servo error meter spread (PAVM) (Test b)	VAC	▨		▨		
B.27.g	MG servo error meter spread (DVM) (Test b)	VDC	▨		▨		
B.27.e	OG servo error meter spread (PAVM) (Test c)	VAC	▨		▨		
B.27.g	OG servo error meter spread (DVM) (Test c)	VDC	▨		▨		
B.44.a	IG torque motor current channel 6	Δv	▨		▨		
	IG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.b	MG torque motor current channel 6	Δv	▨		▨		
	MG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.c	OG torque motor current channel 6	Δv	▨		▨		
	OG torque motor current channel 8	Δv	channel 6 x 1.8		channel 6 x 3.8		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12224
REV G

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	IG 1X resolver cos (Test a) TES 120	vdc	▨		▨		
B.47.c	IG 1X resolver cos (Test a) XBAR 243	vac	▨		▨		
B.47.b	MG 1X resolver cos (Test b) TES 121	vdc	▨		▨		
B.47.c	MG 1X resolver cos (Test b) XBAR 242	vac	▨		▨		
B.47.b	OG 1X resolver cos (Test c) TES 122	vdc	▨		▨		
B.47.c	OG 1X resolver cos (Test c) XBAR 241	vac	▨		▨		
B.47.b	IG 1X resolver sin (Test d) TES 123	vdc	▨		▨		
B.47.c	IG 1X resolver sin (Test d) XBAR 144	vac	▨		▨		

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC
NO. 12224
REV G

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	MG 1X resolver sin (Test e) TES 124	vdc	▨		▨		
B.47.c	MG 1X resolver sin (Test e) XBAR 143	vac	▨		▨		
B.47.b	OG 1X resolver sin (Test f) TES 125	vdc	▨		▨		
B.47.c	OG 1X resolver sin (Test f) XBAR 142	vac	▨		▨		
B.56	Shaft CDU fine error	vdc	4.35		4.81		
B.62	Trunnion CDU fine error	vdc	4.35		4.81		
B.65	Trunnion CDU DAC output	vdc	4.00		5.00		
B.68	Shaft CDU DAC output	vdc	4.00		5.00		
B.76	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 4.0		channel 1 x 6.0		

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC
NO. 12224
REV G

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.83	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 0.4		channel 1 x 0.6		
B.90	SCA input channel 2	Δv	▨		▨		
	SCA output channel 8	Δv	channel 2 x 4.0		channel 2 x 6.0		
B.98	SCA input channel 5	Δv	▨		▨		
	SCA output channel 8	Δv	channel 5 x 0.4		channel 5 x 0.6		
B.103.a	Roll attitude error (PAVM)	vac	▨		▨		
	Roll attitude error (DVM)	vdc	▨		▨		
B.103.b	Yaw attitude error (PAVM)	vac	▨		▨		
	Yaw attitude error (DVM)	vdc	▨		▨		
B.103.c	Pitch attitude error (PAVM)	vac	▨		▨		
	Pitch attitude error (DVM)	vdc	▨		▨		

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EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC
NO. 12224
REV. G

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS	REJ	ACC
B.27	IG servo error = $\frac{\text{SCA output (VDC) Test a}}{\text{SCA input (VAC) Test a}} = 0.91\ (\pm 15\%)$		
	MG servo error = $\frac{\text{SCA output (VDC) Test b}}{\text{SCA input (VAC) Test b}} = 0.91\ (\pm 15\%)$		
	OG servo error = $\frac{\text{SCA output (VDC) Test c}}{\text{SCA input (VAC) Test c}} = 0.91\ (\pm 15\%)$		
B.47	IG 1X resolver cos = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver cos = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver cos = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	IG 1X resolver sin = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver sin = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver sin = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
B.103.a	Roll attitude error = $\frac{2.44\left[\text{SCA output (DVM)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.b	Yaw attitude error = $\frac{2.44\left[\text{SCA output (DVM)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.c	Pitch attitude error = $\frac{2.44\left[\text{SCA output (DVM)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 **REV.** H **PAGE** 1 **OF** 11

INITIAL TDRR 32758 **D.S. PGS** 7

SUBSYSTEM BLOCK II G & N SYSTEM **ASSY.**

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-
C	9-22-67	34705	1, 2, 4	2	EA	-
D	10-12-67	34827	2, 4, 6, 7, 8	-	EA	-
E	11-9-67	35020	1-9	1-3, 5, 7	EA	-
F	1-16-68	35449	7	-	EA	-
G	4-5-68	36040	4, 5	3, 7	EA	-
H	4-29-68	36123	1, 4, 8	5	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL

NOTE: The items marked (≠) are applicable only for SCA P/N 2007235 and are to be omitted for SCA P/N 2007234.

NOTE: Do not command Zero Optics from a Trunnion angle greater than 10°.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in cutout above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly 2900919 (observe placarding on bracket assembly for connector locations) and attach with hex nuts supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

3. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3 respectively.

4. Perform JDC 12204 to advance system to ISS Operate mode.

5. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

6. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28.8 (±0.25) vdc.

7. Press to light OPTICS POWER ON pushbutton on Test Control panel.

8. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to DIRECT
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to DIRECT
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector Panel Position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record that the CMC lamp on the Indicator Control panel lights and then extinguishes. Record the DVM reading after the CMC lamp has extinguished.

PIPA G/S OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 mv/mm and set sensitivity of channel 8 to 5 v/cm. Use ZERO ADJ control to center all traces.

9. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	+00000		ENTR
d.	-04500		ENTR
e.	+03500		ENTR

10. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

NOTE: Perform steps 11 through 14 successively for each Test Selector panel position listed in Table I.

11. Set Test Selector panel to position listed in Table I.

12. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all light indications in step 13.

13. Perform the following DSKY operation: VERB 35 ENTR

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase output
118	Y PIPA G/S in-phase output
119	X PIPA G/S in-phase output

14. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscillograph. Record PIPA loop closure test results as satisfactory if loop closure indication on channel 8 corresponds to loop closure indication on channel 4, 5, or 6.

15. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	+00000		ENTR
c.	-22500		ENTR
d.	-03500		ENTR

16. Repeat steps 11 through 14 then set all Oscillograph Amplifier sensitivities to OFF.

POWER SUPPLY AND TEMPERATURE

17. Measure and record the following voltages by setting CROSSBAR CONTROL on Primary Signal Selector panel to the position indicated and recording the DVM indication and then setting the CROSSBAR CONTROL to 271 to measure the corresponding Test Selector panel positions:

Item	Voltage	CROSSBAR CONTROL	Test Selector
a.	120 vdc PIPA supply level	259	103
b.	2.5 vdc TM bias	N/A	104
c.	3200 cps 28V	123	106
d.	800 cps 28V 1% IMU	121	113

≠e.	800 cps 28V 1% Optics	101	128
f.	PIPA temp	255	201
≠g.	IRIG temp	156	202

NOTE: The SCM TEST TMC INHIBIT lamp on the Temperature Monitor Control panel will light whenever PIPA or IRIG temperature monitor is selected. Ignore lamp indication.

≠18. Connect TPA-2 direct probes to TB4-21 hi and TB5-22 lo. Measure and record X BAR 299 voltage on the DVM.

≠19. Set the Test Selector to position 150 and X BAR to 271. Measure and record the DVM indication.

≠20. Connect TPA-2 direct probes to TB4-20 hi and TB5-33 lo. Measure and record X BAR 299 voltage on DVM.

≠21. Set the Test Selector to position 151 and X BAR to 271. Measure and record the DVM indication.

NOTE: In steps 20 and 21, an indication may or may not be present depending upon blower cycling.

IG, MG, AND OG SERVO ERRORS

22. Perform following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	Observe:		
	VERB 21	NOUN 22	Flashing
d.	+00000		ENTR
e.	Observe:		
	VERB 22	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe:		
	VERB 23	NOUN 22	Flashing
h.	+00000		ENTR

23. Set switches on Signal Generator as follows:

RANGE to X 0.1
FREQUENCY meter to 2
FUNCTION to SQUARE
DC BALANCE to mid position
AMPLITUDE to 70

24. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

25. Set FUNCTION control on PAVM to 0° and set FREQUENCY control to 3200~.

26. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

27. Obtain stabilization loop servo error SCA input and output data on PAVM and DVM for each test listed in table II. For each test, perform following operations:

a. Set CROSSBAR CONTROL on Primary Signal Selector panel to position listed.

b. Set GIMBAL SERVO TEST switch on Test Selector panel to position listed.

c. Set Test Selector panel to position listed.

d. Press to light TEST START pushbutton on Test Selector panel.

Table II

Test	CROSSBAR CONTROL Position (PAVM)	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position (DVM)	Signal
a	135	1	137	IG servo error
b	134	2	138	MG servo error
c	133	3	139	OG servo error

NOTE: The SCA input voltage will cause the PAVM to alternately deflect to the left and right. Determine the maximum deflection in each direction. Add the absolute values to determine maximum meter spread.

e. Record maximum meter spread of SCA input voltage on PAVM.

f. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high and low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.

g. Record maximum meter spread of SCA output voltage on DVM.

h. Press TEST STOP pushbutton on Test Selector panel. The pushbutton shall go out.

28. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall go out.

29 through 35. Deleted.

IG, MG, AND OG TORQUE MOTOR CURRENTS

≠36. Insure that AMPLITUDE control on Signal Generator is set to 0.

≠37. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

≠38. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

≠39. Zero Oscillograph channel 6 and set gain at 0.1 v/cm. Set gain of channel 8 at 1 v/cm and position channel 8 trace as near center as possible with a 2.5 dc bias input.

≠40. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

≠41. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠42. To monitor Signal Generator output on Oscillograph set the Oscillograph Signal Selector to channel 5-1 DC.

≠43. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

≠44. Set GIMBAL SERVO TEST switch on Test Selector panel to OFF. Stop Oscillograph and set sensitivities on Oscillograph Amplifiers to OFF. Record Δ V SCA input signal monitored on channel 6 and Δ V SCA output signal monitored on channel 8.

1X RESOLVER SIN AND COS

45. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe

VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe

VERB 22 NOUN 22 Flashing

e. +04500 ENTR

f. Observe

VERB 23 NOUN 22 Flashing

g. +04500 ENTR

46. Deleted

47. Connect SCA output and SCA input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set CROSSBAR CONTROL switch to 271.

b. Set Test Selector panel to position listed and record DVM indication.

c. Immediately set CROSSBAR CONTROL switch on Primary Signal Selector panel to position listed and record DVM indication.

48. Perform following DSKY operations:

a. Verb 41 NOUN 20 ENTR

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

---

b. Observe

VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe

VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 22 Flashing

g. +00000 ENTR

Table IV

Test	Test Selector Panel Position	CROSS-BAR CON-TROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

SHAFT AND TRUNNION CDU FINE ERROR

49. Deleted.

≠50. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠51. Connect SCA shaft CDU fine error output to DVM by setting Test Selector panel to 146. Set Primary Signal Selector to X BAR 271.

≠52. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

≠53. Connect SCA shaft CDU fine error input to PAVM by connecting PSA TPA-2 buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low). On Aux Input panel run jumper from Probes output direct to PAVM input, and select PAVM Aux position on Primary Signal Select panel.

≠54. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and SET OPTICS MODE switch to MAN.

≠55. Perform following DSKY operations.

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00011 ENTR

≠56. Position Optics Hand Controller on Indicator Control panel to the left until the PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠57. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

≠58. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠59. Connect SCA trunnion CDU fine error output to DVM by setting Test Selector panel to 147. Set Primary Signal Selector to X BAR 271.

≠60. Connect SCA trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

≠61. Repeat steps 54 and 55.

≠62. Position Optics Hand Controller on Indicator Control panel to a down position until PAVM indicates 0.64 VAC in phase.

Record SCA output on DVM at CROSSBAR CONTROL position 271.

63. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00200 ENTR
e. VERB 21 NOUN 10 ENTR
f. 00012 ENTR
g. 00202 ENTR
h. VERB 21 NOUN 01 ENTR
i. 00053 ENTR
j. 40000 ENTR
k. VERB 21 NOUN 01 ENTR
l. 00054 ENTR
m. 40000 ENTR
n. VERB 21 NOUN 10 ENTR
o. 00014 ENTR
p. 06000 ENTR

64. Press to light SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton on Test Selector panel.

65. Measure and record SCA Trunnion CDU DAC output on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 271 and setting Test Selector panel to 126.

66. Measure and record the SCA Shaft CDU DAC output on DVM by setting the Test Selector panel to 127.

67. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00200 ENTR
e. VERB 21 NOUN 10 ENTR
f. 00012 ENTR
g. 00202 ENTR
h. VERB 21 NOUN 01 ENTR
i. 00053 ENTR
j. 37777 ENTR
k. VERB 21 NOUN 01 ENTR
l. 00054 ENTR
m. 37777 ENTR
n. VERB 21 NOUN 10 ENTR
o. 00014 ENTR
p. 06000 ENTR

68. Measure and record SCA Trunnion CDU DAC output on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 271 and setting Test Selector panel to 126.

69. Measure and record the SCA Shaft CDU DAC output on DVM by setting the Test Selector panel to 127.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

≠70. Set Test Selector panel to 129.

≠71. Connect SCA SXT Shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

≠72. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at

1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

✓73. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

✓74. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS ZERO switch (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

✓75. Hold Optics Hand Controller to left limit not longer than 20 seconds.

✓76. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

✓77. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph.

✓78. Connect SCA SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

✓79. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

✓80. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

✓81. Set OPTICS SPEED switch on Indicator Control panel to HI.

✓82. Hold Optics Hand Controller to right limit for approximately 20 seconds.

✓83. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

✓84. Set Test Selector panel to 130 to connect SCA SXT trunnion tach output to Oscillograph.

✓85. Connect SCA SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

✓86. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

✓87. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

✓88. Set OPTICS SPEED switch on Indicator Control panel to MED.

✓89. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

✓90. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

✓91. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph.

✓92. Connect SCA SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

✓93. Insure that CH 5 AC indicator is lighted.

✓94. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

✓95. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

✓96. Set OPTICS SPEED switch on Indicator Control panel to HI.

✓97. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

✓98. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set sensitivities on Oscillograph Amplifiers to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

✓99. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR

✓100. Perform following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00012		ENTR
c.	00060		ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 101. Ignore lamp indication.

✓101. Perform following DSKY operations:

a.	VERB 43		ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+01600		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+01600		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+01600		ENTR

✓102. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM select switch to Aux position on Primary Signal Select panel.

✓103. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA input on PAVM and SCA output on DVM (X BAR 271) for each test.

104. Perform JDC 12204 to turn off G & N system.

105. Perform calculations on data sheets.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

NO. 12224 JDC
REV H
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate	vdc	3.9		4.9		
	28 vdc IMU standby	vdc	3.9		4.9		
	28 vdc optics operate	vdc	3.9		4.9		
B.5	Lamp operation	▨	▨		▨		
	CMC warning	vdc	3.9		4.9		
B.14	Loop closure test 1	▨	▨		▨		
	Loop closure test 2	▨	▨		▨		
	Loop closure test 3	▨	▨		▨		
B.16 (B.14)	Loop closure test 1 Loop closure test 2 Loop closure test 3	▨	▨		▨		
B.17.a	120 vdc XBAR 259	vdc	▨		▨		
	PIPA TES 103 Supply	vdc	2.3		4.7		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12224
REV. H

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.17.b	2.5 vdc TM Bias TES 104		vdc	2.45		2.55		
B.17.c	3200 cps 28V	XBAR 123	vac	▨		▨		
		TES 106	vdc	4.2		4.8		
B.17.d	800 cps 28V 1% IMU	XBAR 121	vac	▨		▨		
		TES 113	vdc	4.2		4.8		
B.17.e	800 cps 28V 1% Optics	XBAR 101	vac	▨		▨		
		TES 128	vdc	4.2		4.8		
B.17.f	PIPA temp	XBAR 255	vdc	▨		▨		
		TES 201	vdc	2.0		3.5		
B.17.g	IRIG temp	XBAR 156	vdc	▨		▨		
		TES 202	vdc	2.37		3.78		
B.18	IMU HEATER current		vdc	▨		▨		
B.19	IMU HEATER current		vdc	3.9		4.8		
B.20	IMU BLOWER current		vac	▨		▨		
B.21	IMU BLOWER current		vdc	4.0		4.6		

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EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12224
REV. H

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.27.e	IG servo error meter spread (PAVM) (Test a)	VAC	▨		▨		
B.27.g	IG servo error meter spread (DVM) (Test a)	VDC	▨		▨		
B.27.e	MG servo error meter spread (PAVM) (Test b)	VAC	▨		▨		
B.27.g	MG servo error meter spread (DVM) (Test b)	VDC	▨		▨		
B.27.e	OG servo error meter spread (PAVM) (Test c)	VAC	▨		▨		
B.27.g	OG servo error meter spread (DVM) (Test c)	VDC	▨		▨		
B.44.a	IG torque motor current channel 6	Δv	▨		▨		
	IG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.b	MG torque motor current channel 6	Δv	▨		▨		
	MG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.c	OG torque motor current channel 6	Δv	▨		▨		
	OG torque motor current channel 8	Δv	channel 6 x 1.8		channel 6 x 3.8		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12224
REV. H

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	IG 1X resolver cos (Test a) TES 120	vdc	▨		▨		
B.47.c	IG 1X resolver cos (Test a) XBAR 243	vac	▨		▨		
B.47.b	MG 1X resolver cos (Test b) TES 121	vdc	▨		▨		
B.47.c	MG 1X resolver cos (Test b) XBAR 242	vac	▨		▨		
B.47.b	OG 1X resolver cos (Test c) TES 122	vdc	▨		▨		
B.47.c	OG 1X resolver cos (Test c) XBAR 241	vac	▨		▨		
B.47.b	IG 1X resolver sin (Test d) TES 123	vdc	▨		▨		
B.47.c	IG 1X resolver sin (Test d) XBAR 144	vac	▨		▨		

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EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC
NO. 12224
REV. H

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	MG 1X resolver sin (Test e) TES 124	vdc	▨		▨		
B.47.c	MG 1X resolver sin (Test e) XBAR 143	vac	▨		▨		
B.47.b	OG 1X resolver sin (Test f) TES 125	vdc	▨		▨		
B.47.c	OG 1X resolver sin (Test f) XBAR 142	vac	▨		▨		
B.56	Shaft CDU fine error	vdc	4.35		4.81		
B.62	Trunnion CDU fine error	vdc	4.35		4.81		
B.65	Trunnion CDU DAC output	vdc	4.00		5.00		
B.66	Shaft CDU DAC output	vdc	4.00		5.00		
B.68	Trunnion CDU DAC output	vdc	0.00		1.00		
B.69	Shaft CDU DAC output	vdc	0.00		1.00		
B.76	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 4.0		channel 1 x 6.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC
NO. 12224
REV. H

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.83	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 0.4		channel 1 x 0.6		
B.90	SCA input channel 2	Δv	▨		▨		
	SCA output channel 8	Δv	channel 2 x 4.0		channel 2 x 6.0		
B.98	SCA input channel 5	Δv	▨		▨		
	SCA output channel 8	Δv	channel 5 x 0.4		channel 5 x 0.6		
B.103.a	Roll attitude error (PAVM)	vac	▨		▨		
	Roll attitude error (DVM)	vdc	▨		▨		
B.103.b	Yaw attitude error (PAVM)	vac	▨		▨		
	Yaw attitude error (DVM)	vdc	▨		▨		
B.103.c	Pitch attitude error (PAVM)	vac	▨		▨		
	Pitch attitude error (DVM)	vdc	▨		▨		

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EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC
NO. 12224
REV. H

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS	REJ	ACC
B.27	IG servo error = $\frac{\text{SCA output (VDC) Test a}}{\text{SCA input (VAC) Test a}} = 0.91\ (\pm 15\%)$		
	MG servo error = $\frac{\text{SCA output (VDC) Test b}}{\text{SCA input (VAC) Test b}} = 0.91\ (\pm 15\%)$		
	OG servo error = $\frac{\text{SCA output (VDC) Test c}}{\text{SCA input (VAC) Test c}} = 0.91\ (\pm 15\%)$		
B.47	IG 1X resolver cos = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver cos = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver cos = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	IG 1X resolver sin = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver sin = $\frac{8.1\left[\text{SCA output(DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver sin = $\frac{8.1\left[\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
B.103.a	Roll attitude error = $\frac{2.44\left[\text{SCA output (DVM)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.b	Yaw attitude error = $\frac{2.44\left[\text{SCA output (DVM)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.c	Pitch attitude error = $\frac{2.44\left[\text{SCA output (DVM)} - 2.5\text{ vdc bias}\right]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		

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BLOCK II SIGNAL CONDITIONER
JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM BLOCK II G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-
C	9-22-67	34705	1, 2, 4	2	EA	-
D	10-12-67	34827	2, 4, 6, 7, 8	-	EA	-
E	11-9-67	35020	1-9	1-3, 5, 7	EA	-
F	1-16-68	35449	7	-	EA	-
G	4-5-68	36040	4, 5	3, 7	EA	-
H	4-29-68	36123	1, 4, 8	5	EA	-
J	6-17-68	36351	1, 4, 5	3	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

INTERVAL

TOOLS AND MATERIAL Decade Inductance, General Radio 1490F or equivalent

NOTE: The items marked (≠) are applicable only for SCA P/N 2007235 and are to be omitted for SCA P/N 2007234.

NOTE: Do not command Zero Optics from a Trunnion angle greater than 10°.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in cutout above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly 2900919 (observe placarding on bracket assembly for connector locations) and attach with hex nuts supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

3. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3 respectively.

4. Perform JDC 12204 to advance system to ISS Operate mode.

5. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

FORM 00133A
Chg. 3-18-66

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6. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28.8 (±0.25) vdc.

7. Press to light OPTICS POWER ON pushbutton on Test Control panel.

8. Perform the following switch settings on the applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to DIRECT
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to DIRECT
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector Panel Position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record that the CMC lamp on the Indicator Control panel lights and then extinguishes. Record the DVM reading after the CMC lamp has extinguished.

PIPA G/S OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 mv/mm and set sensitivity of channel 8 to 5 v/cm. Use ZERO ADJ control to center all traces.

9. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	+00000		ENTR
d.	-04500		ENTR
e.	+03500		ENTR

10. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

NOTE: Perform steps 11 through 14 successively for each Test Selector panel position listed in Table I.

11. Set Test Selector panel to position listed in Table I.

12. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all light indications in step 13.

13. Perform the following DSKY operation:

VERB 35 ENTR

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase output
118	Y PIPA G/S in-phase output
119	X PIPA G/S in-phase output

14. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscillograph. Record PIPA loop closure test results as satisfactory if loop closure indication on channel 8 corresponds to loop closure indication on channel 4, 5, or 6.

15. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	+00000		ENTR
c.	-22500		ENTR
d.	-03500		ENTR

16. Repeat steps 11 through 14 then set all Oscillograph Amplifier sensitivities to OFF.

POWER SUPPLY AND TEMPERATURE

17. Measure and record the following voltages by setting CROSSBAR CONTROL on Primary Signal Selector panel to the position indicated and recording the DVM indication and then setting the CROSSBAR CONTROL to 271 to measure the corresponding Test Selector panel positions:

Item	Voltage	CROSSBAR CONTROL	Test Selector
a.	120 vdc PIPA supply level	259	103
b.	2.5 vdc TM bias	N/A	104
c.	3200 cps 28V	123	106
d.	800 cps 28V 1% IMU	121	113

≠e.	800 cps 28V 1% Optics	101	128
f.	PIPA temp	255	201
≠g.	IRIG temp	156	202

NOTE: The SCM TEST TMC INHIBIT lamp on the Temperature Monitor Control panel will light whenever PIPA or IRIG temperature monitor is selected. Ignore lamp indication.

≠18. Connect TPA-2 direct probes to TB4-21 hi and TB5-22 lo. Measure and record X BAR 299 voltage on the DVM.

≠19. Set the Test Selector to position 150 and X BAR to 271. Measure and record the DVM indication.

≠20. Connect TPA-2 direct probes to TB4-20 hi and TB5-33 lo. Measure and record X BAR 299 voltage on DVM.

≠21. Set the Test Selector to position 151 and X BAR to 271. Measure and record the DVM indication.

NOTE: In steps 20 and 21, an indication may or may not be present depending upon blower cycling.

IG, MG, AND OG SERVO ERRORS

22. Perform following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	Observe:		
	VERB 21	NOUN 22	Flashing
d.	+00000		ENTR
e.	Observe:		
	VERB 22	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe:		
	VERB 23	NOUN 22	Flashing
h.	+00000		ENTR

23. Set switches on Signal Generator as follows:

RANGE to X 0.1
FREQUENCY meter to 2
FUNCTION to SQUARE
DC BALANCE to mid position
AMPLITUDE to 70

24. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

25. Set FUNCTION control on PAVM to 0° and set FREQUENCY control to 3200~.

26. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

27. Obtain stabilization loop servo error SCA input and output data on PAVM and DVM for each test listed in table II. For each test, perform following operations:

a. Set CROSSBAR CONTROL on Primary Signal Selector panel to position listed.

b. Connect Decade Inductance to TPA #2 as listed in Table II.

c. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel and set GIMBAL SERVO TEST switch to position listed.

d. Set Test Selector panel to position listed.

e. Press to light TEST START pushbutton on Test Selector panel.

f. Set SCOPE "A" INPUT SIGNAL switch on Primary Signal Selector panel to SIG 1 and set SCOPE "A" INPUT REFERENCE switch to 3.

g. Monitor the Lissajous pattern on the Oscilloscope and adjust the Decade Inductance until the Lissajous pattern indicates a minimum phase shift.

NOTE: The SCA input voltage will cause the PAVM to alternately deflect to the left and right. Determine the maximum deflection in each direction. Add the absolute values to determine maximum meter spread.

h. Record maximum meter spread of SCA input voltage on PAVM.

i. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high and low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.

j. Record maximum meter spread of SCA output voltage on DVM.

k. Press TEST STOP pushbutton on Test Selector panel. The pushbutton shall go out.

28. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall go out.

29 through 35. Deleted.

Table II

Test	Connect Decade Inductance To TPA #2	CROSSBAR CONTROL Position (PAVM)	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position (DVM)	Signal
a	TB5-32 (HI) TB5-40 (LO)	135	1	137	IG servo error
b	TB5-41 (HI) TB5-40 (LO)	134	2	138	MG servo error
c	TB5-31 (HI) TB5-40 (LO)	133	3	139	OG servo error

IG, MG, AND OG TORQUE MOTOR CURRENTS

≠36. Insure that AMPLITUDE control on Signal Generator is set to 0.

≠37. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

≠38. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

≠39. Zero Oscillograph channel 6 and set gain at 0.1 v/cm. Set gain of channel 8 at 1 v/cm and position channel 8 trace as near center as possible with a 2.5 dc bias input.

≠40. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

≠41. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

≠42. To monitor Signal Generator output on Oscillograph set the Oscillograph Signal Selector to channel 8-1 DC.

≠43. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

≠44. Set GIMBAL SERVO TEST switch on Test Selector panel to OFF. Stop Oscillograph and set sensitivities on Oscillograph Amplifiers to OFF. Record ΔVSCA input signal monitored on channel 6 and ΔVSCA output signal monitored on channel 8.

1X RESOLVER SIN AND COS

45. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+04500		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+04500		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+04500		ENTR

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

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46. Deleted

47. Connect SCA output and SCA input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set CROSSBAR CONTROL switch to 271.

b. Set Test Selector panel to position listed and record DVM indication.

c. Immediately set CROSSBAR CONTROL switch on Primary Signal Selector panel to position listed and record DVM indication.

≠48. Perform following DSKY operations:

a.	Verb 41	NOUN 20	ENTR
b.	Observe		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR

SHAFT AND TRUNNION CDU FINE ERROR

49. Deleted.

≠50. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠51. Connect SCA shaft CDU fine error output to DVM by setting Test Selector panel to 146. Set Primary Signal Selector to X BAR 271.

≠52. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

Table IV

Test	Test Selector Panel Position	CROSSBAR CONTROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

≠53. Connect SCA shaft CDU fine error input to PAVM by connecting PSA TPA-2 buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low). On Aux Input panel run jumper from Probes output direct to PAVM input, and select PAVM Aux position on Primary Signal Select panel.

≠54. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and SET OPTICS MODE switch to MAN.

≠55. Perform following DSKY operations,

a.	VERB 21	NOUN 10	ENTR
b.	00012		ENTR
c.	00011		ENTR

≠56. Position Optics Hand Controller on Indicator Control panel to the left until the PAVM indicates 1.0 VAC in phase. Record SCA output indicated on DVM 271.

≠57. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290 set OPTICS MODE switch to ZERO.

≠58. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

≠59. Connect SCA trunnion CDU fine error output to DVM by setting Test Selector panel to 147. Set Primary Signal Selector to X BAR 271.

≠60. Connect SCA trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

≠61. Repeat steps 54 and 55.

≠62. Position Optics Hand Controller on Indicator Control panel to a down position until PAVM indicates 0.64 VAC in phase. Record SCA output on DVM at CROSSBAR CONTROL position 271.

63. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 21	NOUN 10	ENTR
c.	00012		ENTR
d.	00200		ENTR
e.	VERB 21	NOUN 10	ENTR
f.	00012		ENTR
g.	00202		ENTR
h.	VERB 21	NOUN 01	ENTR
i.	00053		ENTR
j.	40000		ENTR
k.	VERB 21	NOUN 01	ENTR
l.	00054		ENTR
m.	40000		ENTR
n.	VERB 21	NOUN 10	ENTR
o.	00014		ENTR
p.	06000		ENTR

64. Press to light SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton on Test Selector panel.

65. Measure and record SCA Trunnion CDU DAC output on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 271 and setting Test Selector panel to 126.

66. Measure and record the SCA Shaft CDU DAC output on DVM by setting the Test Selector panel to 127.

67. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 21	NOUN 10	ENTR
c.	00012		ENTR
d.	00200		ENTR
e.	VERB 21	NOUN 10	ENTR
f.	00012		ENTR
g.	00202		ENTR
h.	VERB 21	NOUN 01	ENTR
i.	00053		ENTR
j.	37777		ENTR
k.	VERB 21	NOUN 01	ENTR
l.	00054		ENTR
m.	37777		ENTR
n.	VERB 21	NOUN 10	ENTR
o.	00014		ENTR
p.	06000		ENTR

68. Measure and record SCA Trunnion CDU DAC output on DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 271 and setting Test Selector panel to 126.

69. Measure and record the SCA Shaft CDU DAC output on DVM by setting the Test Selector panel to 127.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

ϕ70. Set Test Selector panel to 129.

ϕ71. Connect SCA SXT Shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

ϕ72. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

ϕ73. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

ϕ74. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS ZERO switch (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

ϕ75. Hold Optics Hand Controller to left limit not longer than 20 seconds.

ϕ76. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

ϕ77. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph.

ϕ78. Connect SCA SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

ϕ79. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

ϕ80. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

ϕ81. Set OPTICS SPEED switch on Indicator Control panel to HI.

ϕ82. Hold Optics Hand Controller to right limit for approximately 20 seconds.

ϕ83. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

ϕ84. Set Test Selector panel to 130 to connect SCA SXT trunnion tach output to Oscillograph.

ϕ85. Connect SCA SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

ϕ86. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

ϕ87. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

ϕ88. Set OPTICS SPEED switch on Indicator Control panel to MED.

ϕ89. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

ϕ90. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

ϕ91. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph.

ϕ92. Connect SCA SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

ϕ93. Insure that CH 5 AC indicator is lighted.

ϕ94. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

ϕ95. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

ϕ96. Set OPTICS SPEED switch on Indicator Control panel to HI.

ϕ97. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

ϕ98. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set sensitivities on Oscillograph Amplifiers to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

ϕ99. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

ϕ100. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 101. Ignore lamp indication.

ϕ101. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

ϕ102. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM select switch to Aux position on Primary Signal Select panel.

ϕ103. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA input on PAVM and SCA output on DVM (X BAR 271) for each test.

104. Perform JDC 12204 to turn off G& N system.

105. Perform calculations on data sheets.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 12224 JDC
REV J
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate	vdc	3.9		4.9		
	28 vdc IMU standby	vdc	3.9		4.9		
	28 vdc optics operate	vdc	3.9		4.9		
B.5	Lamp operation	▨	▨		▨		
	CMC warning	vdc	3.9		4.9		
B.14	Loop closure test 1	▨	▨		▨		
	Loop closure test 2	▨	▨		▨		
	Loop closure test 3	▨	▨		▨		
B.16 (B.14)	Loop closure test 1 Loop closure test 2 Loop closure test 3	▨	▨		▨		
B.17.a	120 vdc XBAR 259	vdc	▨		▨		
	PIPA TES 103 Supply	vdc	2.3		4.7		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12224
REV. J

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER		UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.17.b	2.5 vdc TM Bias TES 104		vdc	2.45		2.55		
B.17.c	3200 cps 28V	XBAR 123	vac	▨		▨		
		TES 106	vdc	4.2		4.8		
B.17.d	800 cps 28V 1% IMU	XBAR 121	vac	▨		▨		
		TES 113	vdc	4.2		4.8		
B.17.e	800 cps 28V 1% Optics	XBAR 101	vac	▨		▨		
		TES 128	vdc	4.2		4.8		
B.17.f	PIPA temp	XBAR 255	vdc	▨		▨		
		TES 201	vdc	2.0		3.5		
B.17.g	IRIG temp	XBAR 156	vdc	▨		▨		
		TES 202	vdc	2.37		3.75		
B.18	IMU HEATER current		vdc	▨		▨		
B.19	IMU HEATER current		vdc	3.9		4.8		
B.20	IMU BLOWER current		vac	▨		▨		
B.21	IMU BLOWER current		vdc	4.0		4.6		

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC
NO. 12224
REV. J

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.27.h	IG servo error meter spread (PAVM) (Test a)	VAC	▨		▨		
B.27.j	IG servo error meter spread (DVM) (Test a)	VDC	▨		▨		
B.27.h	MG servo error meter spread (PAVM) (Test b)	VAC	▨		▨		
B.27.j	MG servo error meter spread (DVM) (Test b)	VDC	▨		▨		
B.27.h	OG servo error meter spread (PAVM) (Test c)	VAC	▨		▨		
B.27.j	OG servo error meter spread (DVM) (Test c)	VDC	▨		▨		
B.44.a	IG torque motor current channel 6	Δv	▨		▨		
	IG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.b	MG torque motor current channel 6	Δv	▨		▨		
	MG torque motor current channel 8	Δv	channel 6 x 4		channel 6 x 6		
B.44.c	OG torque motor current channel 6	Δv	▨		▨		
	OG torque motor current channel 8	Δv	channel 6 x 1.8		channel 6 x 3.8		

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC
NO. 12224
REV. J

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	IG 1X resolver cos (Test a) TES 120	vdc	▨		▨		
B.47.c	IG 1X resolver cos (Test a) XBAR 243	vac	▨		▨		
B.47.b	MG 1X resolver cos (Test b) TES 121	vdc	▨		▨		
B.47.c	MG 1X resolver cos (Test b) XBAR 242	vac	▨		▨		
B.47.b	OG 1X resolver cos (Test c) TES 122	vdc	▨		▨		
B.47.c	OG 1X resolver cos (Test c) XBAR 241	vac	▨		▨		
B.47.b	IG 1X resolver sin (Test d) TES 123	vdc	▨		▨		
B.47.c	IG 1X resolver sin (Test d) XBAR 144	vac	▨		▨		

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EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC
NO. 12224
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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.47.b	MG 1X resolver sin (Test e) TES 124	vdc	▨		▨		
B.47.c	MG 1X resolver sin (Test e) XBAR 143	vac	▨		▨		
B.47.b	OG 1X resolver sin (Test f) TES 125	vdc	▨		▨		
B.47.c	OG 1X resolver sin (Test f) XBAR 142	vac	▨		▨		
B.56	Shaft CDU fine error	vdc	4.35		4.81		
B.62	Trunnion CDU fine error	vdc	4.35		4.81		
B.65	Trunnion CDU DAC output	vdc	4.00		5.00		
B.66	Shaft CDU DAC output	vdc	4.00		5.00		
B.68	Trunnion CDU DAC output	vdc	0.00		1.00		
B.69	Shaft CDU DAC output	vdc	0.00		1.00		
B.76	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 4.0		channel 1 x 6.0		

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DATA SHEET 6 **OF** 7

JDC
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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.83	SCA input channel 1	Δv	▨		▨		
	SCA output channel 8	Δv	channel 1 x 0.4		channel 1 x 0.6		
B.90	SCA input channel 2	Δv	▨		▨		
	SCA output channel 8	Δv	channel 2 x 4.0		channel 2 x 6.0		
B.98	SCA input channel 5	Δv	▨		▨		
	SCA output channel 8	Δv	channel 5 x 0.4		channel 5 x 0.6		
B.103.a	Roll attitude error (PAVM)	vac	▨		▨		
	Roll attitude error (DVM)	vdc	▨		▨		
B.103.b	Yaw attitude error (PAVM)	vac	▨		▨		
	Yaw attitude error (DVM)	vdc	▨		▨		
B.103.c	Pitch attitude error (PAVM)	vac	▨		▨		
	Pitch attitude error (DVM)	vdc	▨		▨		

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JDC
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JDC ITEM NO.	CALCULATIONS	REJ	ACC
B.27	IG servo error = $\frac{\text{SCA output (VDC) Test a}}{\text{SCA input (VAC) Test a}} = 0.91\ (\pm 15\%)$		
	MG servo error = $\frac{\text{SCA output (VDC) Test b}}{\text{SCA input (VAC) Test b}} = 0.91\ (\pm 15\%)$		
	OG servo error = $\frac{\text{SCA output (VDC) Test c}}{\text{SCA input (VAC) Test c}} = 0.91\ (\pm 15\%)$		
B.47	IG 1X resolver cos = $\frac{8.1\ [\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver cos = $\frac{8.1\ [\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver cos = $\frac{8.1\ [\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	IG 1X resolver sin = $\frac{8.1\ [\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	MG 1X resolver sin = $\frac{8.1\ [\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
	OG 1X resolver sin = $\frac{8.1\ [\text{SCA output (DVM) (TES)} - 2.5\text{ vdc bias}]}{\text{SCA input (DVM) (XBAR)}} = 1\ (\pm 10\%)$		
B.103.a	Roll attitude error = $\frac{2.44\ [\text{SCA output (DVM)} - 2.5\text{ vdc bias}]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.b	Yaw attitude error = $\frac{2.44\ [\text{SCA output (DVM)} - 2.5\text{ vdc bias}]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		
B.103.c	Pitch attitude error = $\frac{2.44\ [\text{SCA output (DVM)} - 2.5\text{ vdc bias}]}{\text{SCA input (PAVM)}} = 1\ (\pm 10\%)$		

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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INITIAL TDRR 32758 D.S. PGS 9

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-
C	9-22-67	34705	1,2,4	2	EA	-
D	10-12-67	34827	2,4,6,7,8	-	EA	-
E	11-9-67	35020	1-9	1-3,5,7	EA	-
F	1-16-68	35449	7	-	EA	-
G	4-5-68	36040	4,5	3,7	EA	-
H	4-29-68	36123	1,4,8	5	EA	-
J	6-17-68	36351	1,4,5	3	EA	-
K	12-27-68	37152	All	All	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL Decade Inductance, General Radio 1490F or equivalent

IMPORTANT: 1. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

2. Insure that connector assembly (2003099) is removed and cable W226-P1 is connected to CGC test connector before proceeding with this JDC.

NOTE: The items marked with an asterisk (*) are applicable only for SCA P/N 2007035 and are to be omitted for SCA P/N 2007234.

NOTE: Do not command zero optics from a trunnion angle greater than 10°.

A. PREPARATION

1. Perform JDC 12204 to downmode to CIA PILOT POWER mode.

2. Position SCA in cutout above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly (observe placarding on bracket assembly for connector locations) and attach with hex nuts

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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SUBSYSTEM G & N SYSTEM

ASSY

supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

4. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3, respectively.

5. Perform JDC 12204 to advance system to ISS Operate mode.

6. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.

7. Adjust G&N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28.8 (±0.25) vdc.

8. Press to light OPTICS POWER ON pushbutton on Test Control panel.

9. Perform following switch settings on applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set -
  (1) OPTICS ZERO to OFF then to ZERO
  (2) OPTICS TEL TRUN to SLAVE TO SXT
  (3) OPTICS COUPLING to DIRECT
  (4) OPTICS MODE to MAN
  (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set -
  (1) OPTICS MODE to MAN then to ZERO
  (2) OPTICS CONTROLLER SPEED to LO
  (3) OPTICS CONTROLLER COUPLING to DIRECT
  (4) OPTICS TRACKER to OFF
  (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit of Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last last two digits of Test Selector panel position.

2. Set Test Selector panel to 101 and measure and record 28 vdc CGC operate voltage on DVM. (SCA output.)

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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SUBSYSTEM G & N SYSTEM

ASSY

3. Set Test Selector panel to 102 and measure and record 28 vdc IMU standby voltage on DVM. (SCA output.)

4. Set Test Selector panel to 203 and measure and record 28 vdc optics operate voltage on DVM. (SCA output.)

CMC WARNING

5. Set Test Selector panel to 204 to monitor +28 vdc CMC warning voltage on DVM.

6. Enter VERB 35 into DSKY and press ENTR pushbutton.

7. Record that CMC lamp on Indicator Control panel lights and then goes out. Record DVM indication after CMC lamp goes out. (SCA otuput.)

PIPA G/S OUTPUT

8. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

9. Insure that CH4AC, CH5AC, and CH6AC pushbuttons on Oscillograph Signal Selector panel are lighted.

10. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 MV/MM and set sensitivity of channel 8 to 5 V/CM. Use ZERO ADJ control to center all traces.

11. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
  VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
  VERB 22 NOUN 22 Flashing
f. -04500 ENTR
g. Observe:
  VERB 23 NOUN 22 Flashing
h. +03500 ENTR

12. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

13. Set Test Selector panel to 117 to monitor Z PIPA G/S in-phase output on channels 4 and 8.

14. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all lamp indications which occur during performance of step 15.

15. Enter VERB 35 into DSKY and press ENTR pushbutton.

16. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds and then closing.

17. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record Z PIPA loop closure test results as satisfactory if loop closure indication on channel 8 (SCA output) corresponds to loop closure indication on channel 4 (SCA input).

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 REV K PAGE 4 OF 15

SUBSYSTEM G & N SYSTEM

ASSY

18. Set Test Selector panel to 118 to monitor Y PIPA G/S in-phase output on channels 5 and 8.

19. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all lamp indications which occur during performance of step 20.

20. Enter VERB 35 into DSKY and press ENTR pushbutton.

21. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds and then closing.

22. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record Y PIPA loop closure test results as satisfactory if loop closure indication on channel 8 (SCA output) corresponds to loop closure indication on channel 5 (SCA input).

23. Set Test Selector panel to 119 to monitor X PIPA G/S in-phase output on channels 6 and 8.

24. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all lamp indications which occur during performance of step 25.

25. Enter VERB 35 into DSKY and press ENTR pushbutton.

26. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds and then closing.

27. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record X PIPA loop closure test results as satisfactory if loop closure indication on Channel 8 (SCA output) corresponds to loop closure indication on channel 6 (SCA input).

28. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
  VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
  VERB 22 NOUN 22 Flashing
e. -22500 ENTR
f. Observe:
  VERB 23 NOUN 22 Flashing
g. -03500 ENTR

29. Repeat steps 13 through 27 and then set all Oscillograph Amplifier sensitivities to OFF.

POWER SUPPLY AND TEMPERATURE

30. Set CROSSBAR CONTROL on Primary Signal Selector panel to 259 and measure and record 120 vdc PIPA supply voltage on DVM. (SCA input.)

31. Set CROSSBAR CONTROL to 271.

32. Set Test Selector panel to 103 and measure and record 120 vdc PIPA supply voltage on DVM. (SCA output.)

33. Set Test Selector panel to 104 and measure and record 2.5 vdc TM bias voltage on DVM.

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34. Set CROSSBAR CONTROL on Primary Signal Selector panel to 123 and measure and record 28 volt 3200 cps supply voltage on DVM. (SCA input.)

35. Set CROSSBAR CONTROL to 271.

36. Set Test Selector panel to 106 and measure and record 28 volt 3200 cps supply voltage on DVM. (SCA output.)

37. Set CROSSBAR CONTROL on Primary Signal Selector panel to 121 and measure and record IMU 28 volt 800 cps 1% supply voltage on DVM. (SCA input.)

38. Set CROSSBAR CONTROL to 271.

39. Set Test Selector panel to 113 and measure and record IMU 28 volt 800 cps 1% supply voltage on DVM. (SCA output.)

*40. Set CROSSBAR CONTROL on Primary Signal Selector panel to 101 and measure and record optics 28 volt 800 cps 1% supply voltage on DVM. (SCA input.)

*41. Set CROSSBAR CONTROL to 271.

*42. Set Test Selector panel to 128 and measure and record optics 28 volt 800 cps 1% supply voltage on DVM. (SCA output.)

43. Set CROSSBAR CONTROL on Primary Signal Selector panel to 255 and measure and record PIPA temperature on DVM. (SCA input.)

44. Set CROSSBAR CONTROL to 271.

45. Set Test Selector panel to 201 and measure and record PIPA temperature on DVM. (SCA output.)

*46. Set CROSSBAR CONTROL on Primary Signal Selector panel to 156 and measure and record IRIG temperature on DVM. (SCA input.)

*47. Set CROSSBAR CONTROL to 271.

*48. Set Test Selector panel to 202 and measure and record IRIG temperature on DVM. (SCA output.)

> NOTE: SCM TEST TMC INHIBIT lamp on Temperature Monitor Control panel will light whenever PIPA or IRIG temperature monitor is selected (steps 43 through 48). Ignore lamp indication.

*49. Set CROSSBAR CONTROL on Primary Signal Selector panel to 299.

*50. Connect PSA TPA direct probes to TB4-21 (high) and TB5-22 (low) and measure and record IMU heater current on DVM. (SCA input.)

*51. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

*52. Set Test Selector panel to 150 and measure and record IMU heater current on DVM. (SCA output.)

*53. Set CROSSBAR CONTROL on Primary Signal Selector panel to 299.

> NOTE: An indication may or may not be present during performance of steps 54 and 56 depending upon blower cycling.

*54. Connect PSA TPA direct probes to TB4-20 (high) and TB5-33 (low) and measure and record IMU blower current on DVM. (SCA input.)

*55. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

*56. Set Test Selector panel to 151 and measure and record IMU blower current on DVM. (SCA output.)

IG, MG, AND OG SERVO ERRORS

57. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

58. Set switches on Signal Generator as follows:

RANGE to X 0.1
FREQUENCY meter to 2
FUNCTION to SQUARE
DC BALANCE to mid position
AMPLITUDE TO 70

59. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

60. Set FUNCTION control on PAVM to 0° and FREQUENCY control to 3200 ~.

61. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

62. Set CROSSBAR CONTROL on Primary Signal Selector panel to 135 to monitor IG servo error on PAVM.

63. Connect decade inductance to PSA TPA test points TB5-32 (high) and TB5-40 (low).

64. Set GIMBAL SERVO TEST switch on Test Selector panel to 1.

65. Set Test Selector panel to 137.

66. Press to light TEST START pushbutton.

67. Set SCOPE "A" INPUT SIGNAL switch on Primary Signal Selector panel to SIG 1 and SCOPE "A" INPUT REFERENCE switch to 3.

68. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

69. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

70. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low

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voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

71. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

72. Calculate IG servo error SCA output to IG servo error SCA input as follows.

Record result:

$$\text{IG servo error} = \frac{\text{Step 70, max meter spread}}{\text{Step 69, max meter spread}} = 0.91\ (\pm 15\%)$$

73. Set CROSSBAR CONTROL on Primary Signal Selector panel to 134 to monitor MG servo error on PAVM.

74. Connect decade inductance to PSA TPA test points TB5-41 (high) and TB5-40 (low).

75. Set GIMBAL SERVO TEST switch on Test Selector panel to 2.

76. Set Test Selector panel to 138.

77. Press to light TEST START pushbutton.

78. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

79. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

80. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

81. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

82. Calculate MG servo error SCA output to MG servo error SCA input as follows.

Record result:

$$\text{MG servo error} = \frac{\text{Step 80, max meter spread}}{\text{Step 79, max meter spread}} = 0.91\ (\pm 15\%)$$

83. Set CROSSBAR CONTROL on Primary Signal Selector panel to 133 to monitor OG servo error on PAVM.

84. Connect decade inductance to PSA TPA test points TB5-31 (high) and TB5-40 (low).

85. Set GIMBAL SERVO TEST switch on Test Selector panel to 3.

86. Set Test Selector panel to 139.

87. Press to light TEST START pushbutton.

88. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

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89. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

90. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

91. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

92. Calculate OG servo error SCA output to OG servo error SCA input as follows.

Record result:

$$\text{OG servo error} = \frac{\text{Step 90, max meter spread}}{\text{Step 89, max meter spread}} = 0.91\ (\pm 15\%)$$

93. Press to extinguish GIMBAL SERVO TEST pushbutton on Test Selector panel.

IG, MG, AND OG TORQUE MOTOR CURRENTS

*94. Insure that AMPLITUDE control on Signal Generator is set to 0.

*95. Connect jumper between PROBES OUTPUT DIRECT jacks and CH6DC IN jacks on Auxiliary Input panel.

*96. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

*97. Insure that CH6DC indicator is lighted.

*98. Zero Oscillograph channel 6 and set sensitivity to 0.1 V/CM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 trace as near center as possible with a 2.5 vdc bias input.

*99. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

*100. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*101. Set CROSSBAR CONTROL on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.

*102. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

*103. Connect PSA TPA direct probes to TB2-31 (high) and TB1-49 (low) to monitor IG torque motor current on channel 6. (SCA input.)

*104. Set Test Selector panel to 132 and GIMBAL SERVO TEST switch to 1 to monitor IG torque motor current on channel 8. (SCA output.)

*105. Press to light TEST START pushbutton.

*106. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 2 volts peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*107. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*108. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*109. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*110. Connect PSA TPA direct probes to TB2-32 (high) and TB1-49 (low) to monitor MG torque motor current on channel 6. (SCA input.)

*111. Press to light TEST START pushbutton.

*112. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*113. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*114. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*115. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*116. Connect PSA TPA direct probes to TB1-45 (high) and TB1-49 (low) to monitor OG torque motor current on channel 6. (SCA input.)

*117. Press to light TEST START pushbutton.

*118. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*119. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*120. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*121. Set GIMBAL SERVO TEST switch on Test Selector panel to OFF. Set CHART DRIVE switch on Oscillograph Control panel to OFF and set sensitivities on Oscillograph Amplifiers to OFF.

1X RESOLVER SIN AND COS

122. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR

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123. Set CROSSBAR CONTROL on Primary Signal Selector panel to 243 and measure and record IG 1X resolver cos voltage indicated on DVM. (SCA input.)

124. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 120. Measure and record IG 1X resolver cos voltage indicated on DVM. (SCA output.)

125. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:

IG 1X resolver cos =

$$\frac{8.1\ (\text{Step 124 - Step 33})}{\text{Step 123}} = 1\ (\pm 10\%)$$

126. Set Test Selector panel to 121 and measure and record MG 1X resolver cos voltage indicated on DVM. (SCA output.)

127. Set CROSSBAR CONTROL on Primary Signal Selector panel to 242 and measure and record MG 1X resolver cos voltage indicated on DVM. (SCA input.)

128. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:

MG 1X resolver cos =

$$\frac{8.1\ (\text{Step 126 - Step 33})}{\text{Step 127}} = 1\ (\pm 10\%)$$

129. Set CROSSBAR CONTROL on Primary Signal Selector panel to 241 and measure and record OG 1X resolver cos voltage indicated on DVM. (SCA input.)

130. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 122. Measure and record OG 1X resolver cos voltage indicated on DVM. (SCA output.)

131. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:

OG 1X resolver cos =

$$\frac{8.1\ (\text{Step 130 - Step 33})}{\text{Step 129}} = 1\ (\pm 10\%)$$

132. Set Test Selector panel to 123 and measure and record IG 1X resolver sin voltage indicated on DVM. (SCA output.)

133. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (SCA input.)

134. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:

IG 1X resolver sin =

$$\frac{8.1\ (\text{Step 132 - Step 33})}{\text{Step 133}} = 1\ (\pm 10\%)$$

135. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (SCA input.)

136. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 124. Measure and record MG 1X resolver sin voltage indicated on DVM. (SCA output.)

---

137. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:

MG 1X resolver sin =

$$\frac{8.1\ (\text{Step 136 - Step 33})}{\text{Step 135}} = 1\ (\pm 10\%)$$

138. Set Test Selector panel to 125 and measure and record OG 1X resolver sin voltage indicated on DVM. (SCA output.)

139. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM (SCA input.)

140. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:

OG 1X resolver sin =

$$\frac{8.1\ (\text{Step 138 - Step 33})}{\text{Step 139}} = 1\ (\pm 10\%)$$

141. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

SHAFT AND TRUNNION CDU FINE ERROR

*142. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

*143. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

*144. Set Test Selector panel to 146 to connect SCA shaft CDU fine error output to DVM.

*145. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*146. Set PAVM switch on Primary Signal Selector panel to AUX.

*147. Connect PSA TPA buffered probes to TB3-23 (high) and TB3-34 (low) to connect SCA shaft CDU fine error input to PAVM.

*148. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

*149. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

*150. Position Optics Hand Controller on Indicator Control panel to the left until PAVM indicates 1.0 vac in-phase. Record SCA output indicated on DVM.

*151. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

*152. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

*153. Set Test Selector panel to 147 to connect SCA trunnion CDU fine error output to DVM.

---

*154. Connect PSA TPA buffered probes to TB3-22 (high) and TB3-34 (low) to connect SCA trunnion CDU fine error input to PAVM.

*155. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

*156. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

*157. Position Optics Hand Controller on Indicator Control panel to a down position until PAVM indicates 0.64 vac in-phase. Record SCA output indicated on DVM.

*158. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00200 ENTR
e. VERB 21 NOUN 10 ENTR
f. 00012 ENTR
g. 00202 ENTR
h. VERB 21 NOUN 01 ENTR
i. 00053 ENTR
j. 40000 ENTR
k. VERB 21 NOUN 01 ENTR
l. 00054 ENTR
m. 40000 ENTR
n. VERB 21 NOUN 10 ENTR
o. 00014 ENTR
p. 06000 ENTR

*159. Set Test Selector panel to 126 and measure and record SCA trunnion CDU DAC output indicated on DVM.

*160. Set Test Selector panel to 127 and measure and record SCA shaft CDU DAC output indicated on DVM.

*161. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00200 ENTR
e. VERB 21 NOUN 10 ENTR
f. 00012 ENTR
g. 00202 ENTR
h. VERB 21 NOUN 01 ENTR
i. 00053 ENTR
j. 37777 ENTR
k. VERB 21 NOUN 01 ENTR
l. 00054 ENTR
m. 37777 ENTR
n. VERB 21 NOUN 10 ENTR
o. 00014 ENTR
p. 06000 ENTR

*162. Set Test Selector panel to 126 and measure and record SCA trunnion CDU DAC output indicated on DVM.

*163. Set Test Selector panel to 127 and measure and record SCA shaft CDU DAC output indicated on DVM.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

*164. Set Test Selector panel to 129.

*165. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

*166. Zero Oscillograph channel 1 and set sensitivity to 20 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*167. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

*168. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS ZERO switch (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

*169. Hold Optics Hand Controller to left limit not longer than 20 seconds.

*170. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

*171. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph channel 8.

*172. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to connect SCA SCT shaft tach input to channel 1.

*173. Zero Oscillograph channel 1 and set sensitivity to 200 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*174. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*175. Set OPTICS SPEED switch on Indicator Control panel to HI.

*176. Hold Optics Hand Controller to right limit for approximately 20 seconds.

*177. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

*178. Set Test Selector panel to 130 to connect SCA SXT trunnion tach output to Oscillograph channel 8.

*179. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 to connect SCA SXT trunnion tach input to Oscillograph channel 2.

*180. Zero Oscillograph channel 2 and set sensitivity to 20 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*181. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*182. Set OPTICS SPEED switch on Indicator Control panel to MED.

*183. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

---

*184. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

*185. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph channel 8.

*186. Set CHANNEL 5 switch on Oscillograph Signal Selector panel to 11 to connect SCA SCT trunnion tach input to Oscillograph channel 5.

*187. Insure that CH5AC indicator on Oscillograph Signal Selector panel is lighted.

*188. Zero Oscillograph channel 5 and set sensitivity to 50 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*189. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*190. Set OPTICS SPEED switch on Indicator Control panel to HI.

*191. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

*192. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set sensitivities on Oscillograph Amplifiers to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

*193. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 21 NOUN 10 ENTR
i. 00012 ENTR
j. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during performance of step 194. Ignore lamp indication.

*194. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

*195. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM switch on Primary Signal Selector panel to AUX.

---

*196. Connect PSA TPA direct probes to TB4-44 (high) and TB4-48 (low) and measure and record SCA yaw attitude error input indicated on PAVM.

*197. Set Test Selector panel to 114 and measure and record SCA yaw attitude error output indicated on DVM.

*198. Calculate SCA yaw attitude error output to SCA yaw attitude error input as follows. Record result:

Yaw attitude error =

$$\frac{2.44\ (\text{Step 197 - Step 33})}{\text{Step 196}} = 1\ (\pm 10\%)$$

*199. Connect PSA TPA direct probes to TB4-45 (high) and TB4-49 (low) and measure and record SCA pitch attitude error input indicated on PAVM.

*200. Set Test Selector panel to 115 and measure and record SCA pitch attitude error output indicated on DVM.

*201. Calculate SCA pitch attitude error output to SCA pitch attitude error input as follows. Record result:

Pitch attitude error =

$$\frac{2.44\ (\text{Step 200 - Step 33})}{\text{Step 199}} = 1\ (\pm 10\%)$$

*202. Connect PSA TPA direct probes to TB4-43 (high) and TB4-47 (low) and measure and record SCA roll attitude error input indicated on PAVM.

*203. Set Test Selector panel to 116 and measure and record SCA roll attitude error output indicated on DVM.

*204. Calculate SCA roll attitude error output to SCA roll attitude error input as follows. Record result:

Roll attitude error =

$$\frac{2.44\ (\text{Step 203 - Step 33})}{\text{Step 202}} = 1\ (\pm 10\%)$$

205. Perform JDC 12204 to turn off G & N system.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC NO. 12224
REV K
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2	28 vdc CGC operate	vdc	3.9		4.9		
3	28 vdc IMU standby	vdc	3.9		4.9		
4	28 vdc optics operate	vdc	3.9		4.9		
7	Lamp operation	▨	▨		▨		
	CMC warning voltage	vdc	3.9		4.9		
17	Z PIPA loop closure	▨	▨		▨		
22	Y PIPA loop closure	▨	▨		▨		
27	X PIPA loop closure	▨	▨		▨		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 **OF** 9

JDC
NO. 12224
REV. K

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29(17)	Z PIPA loop closure	▨	▨		▨		
29(22)	Y PIPA loop closure	▨	▨		▨		
29(27)	X PIPA loop closure	▨	▨		▨		
30	120 vdc PIPA supply	vdc	▨		▨	▨	▨
32	120 vdc PIPA supply	vdc	2.3		4.7		
33	2.5 vdc TM bias	vdc	2.45		2.55		
34	3200 cps 28 volts	vac	▨		▨	▨	▨
36	3200 cps 28 volts	vdc	4.2		4.8		
37	800 cps 28 volts 1% IMU	vac	▨		▨	▨	▨
39	800 cps 28 volts 1% IMU	vdc	4.2		4.8		
40	800 cps 28 volts 1% optics	vac	▨		▨	▨	▨
42	800 cps 28 volts 1% optics	vdc	4.2		4.8		
43	PIPA temperature	vdc	▨		▨	▨	▨

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 9

JDC
NO. 12224
REV. K

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
45	PIPA temperature	vdc	2.0		3.5		
46	IRIG temperature	vdc	▨		▨	▨	▨
48	IRIG temperature	vdc	2.37		3.75		
50	IMU heater current	vdc	▨		▨	▨	▨
52	IMU heater current	vdc	3.9		4.8		
54	IMU blower current	vdc	▨		▨	▨	▨
56	IMU blower current	vdc	4.0		4.6		
69	Maximum right	vac	▨		▨	▨	▨
	Maximum left	vac	▨		▨	▨	▨
	Maximum meter spread	vac	▨		▨	▨	▨
70	High voltage	vdc	▨		▨	▨	▨
	Low voltage	vdc	▨		▨	▨	▨
	Maximum meter spread	vdc	▨		▨	▨	▨
72	IG servo error	▨	0.7735		1.0465		
79	Maximum right	vac	▨		▨	▨	▨
	Maximum left	vac	▨		▨	▨	▨
	Maximum meter spread	vac	▨		▨	▨	▨
80	High voltage	vdc	▨		▨	▨	▨

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 9

JDC
NO. 12224
REV. K

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
80 (cont)	Low voltage	vdc	▨		▨	▨	▨
	Maximum meter spread	vdc	▨		▨	▨	▨
82	MG servo error	▨	0.7735		1.0465		
89	Maximum right	vac	▨		▨	▨	▨
	Maximum left	vac	▨		▨	▨	▨
	Maximum meter spread	vac	▨		▨	▨	▨
90	High voltage	vdc	▨		▨	▨	▨
	Low voltage	vdc	▨		▨	▨	▨
	Maximum meter spread	vdc	▨		▨	▨	▨
92	OG servo error	▨	0.7735		1.0465		
108	IG torque motor current (channel 6)	Δv	▨		▨	▨	▨
	IG torque motor current (channel 8)	Δv	channel 6 x 4		channel 6 x 6		
114	MG torque motor current (channel 6)	Δv	▨		▨	▨	▨
	MG torque motor current (channel 8)	Δv	channel 6 x 4		channel 6 x 6		
120	OG torque motor current (channel 6)	Δv	▨		▨	▨	▨

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EQUIPMENT TEST
DATA SHEET 5 **OF** 9

JDC
NO. 12224
REV. K

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
120 (cont)	OG torque motor current (channel 8)	Δv	channel 6 x 1.8		channel 6 x 3.8		
123	IG 1X resolver cos	vac	▨		▨	▨	▨
124	IG 1X resolver cos	vdc	▨		▨	▨	▨
125	IG 1X resolver cos	▨	0.90		1.10		
126	MG 1X resolver cos	vdc	▨		▨	▨	▨
127	MG 1X resolver cos	vac	▨		▨	▨	▨
128	MG 1X resolver cos	▨	0.90		1.10		
129	OG 1X resolver cos	vac	▨		▨	▨	▨
130	OG 1X resolver cos	vdc	▨		▨	▨	▨
131	OG 1X resolver cos	▨	0.90		1.10		
132	IG 1X resolver sin	vdc	▨		▨	▨	▨
133	IG 1X resolver sin	vac	▨		▨	▨	▨
134	IG 1X resolver sin	▨	0.90		1.10		
135	MG 1X resolver sin	vac	▨		▨	▨	▨
136	MG 1X resolver sin	vdc	▨		▨	▨	▨
137	MG 1X resolver sin	▨	0.90		1.10		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 **OF** 9

JDC NO. 12224
REV. K

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
138	OG 1X resolver sin	vdc	▨		▨	▨	▨
139	OG 1X resolver sin	vac	▨		▨	▨	▨
140	OG 1X resolver sin	▨	0.90		1.10		
150	Shaft CDU fine error	vdc	4.35		4.81		
157	Trunnion CDU fine error	vdc	4.35		4.81		
159	Trunnion CDU DAC output	vdc	4.00		5.00		
160	Shaft CDU DAC output	vdc	4.00		5.00		
162	Trunnion CDU DAC output	vdc	0.00		1.00		
163	Shaft CDU DAC output	vdc	0.00		1.00		
170	SCA input (channel 1)	Δv	▨		▨	▨	▨
	SCA output (channel 8)	Δv	channel 1 x 4.0		channel 1 x 6.0		
177	SCA input (channel 1)	Δv	▨		▨	▨	▨
	SCA output (channel 8)	Δv	channel 1 x 0.4		channel 1 x 0.6		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 9

JDC NO. 12224
REV. K

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
184	SCA input (channel 2)	Δv	▨		▨	▨	▨
	SCA output (channel 8)	Δv	channel 2 x 4.0		channel 2 x 6.0		
192	SCA input (channel 5)	Δv	▨		▨	▨	▨
	SCA output (channel 8)	Δv	channel 5 x 0.4		channel 5 x 0.6		
196	Yaw attitude error	vac	▨		▨	▨	▨
197	Yaw attitude error	vdc	▨		▨	▨	▨
198	Yaw attitude error	▨	0.90		1.10		
199	Pitch attitude error	vac	▨		▨	▨	▨
200	Pitch attitude error	vdc	▨		▨	▨	▨
201	Pitch attitude error	▨	0.90		1.10		
202	Roll attitude error	vac	▨		▨	▨	▨
203	Roll attitude error	vdc	▨		▨	▨	▨
204	Roll attitude error	▨	0.90		1.10		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 9

JDC NO. 12224
REV. K

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
72	IG servo error = $\frac{\text{Step 70, max meter spread}}{\text{Step 69, max meter spread}} = 0.91\ (\pm 15\%)$
82	MG servo error = $\frac{\text{Step 80, max meter spread}}{\text{Step 79, max meter spread}} = 0.91\ (\pm 15\%)$
92	OG servo error = $\frac{\text{Step 90, max meter spread}}{\text{Step 89, max meter spread}} = 0.91\ (\pm 15\%)$
125	IG 1X resolver cos = $\frac{8.1 \times (\text{Step 124} - \text{Step 33})}{\text{Step 123}} = 1\ (\pm 10\%)$
128	MG 1X resolver cos = $\frac{8.1 \times (\text{Step 126} - \text{Step 33})}{\text{Step 127}} = 1\ (\pm 10\%)$
131	OG 1X resolver cos = $\frac{8.1 \times (\text{Step 130} - \text{Step 33})}{\text{Step 129}} = 1\ (\pm 10\%)$
134	IG 1X resolver sin = $\frac{8.1 \times (\text{Step 132} - \text{Step 33})}{\text{Step 133}} = 1\ (\pm 10\%)$

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 **OF** 9

JDC NO. 12224
REV. K

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
137	MG 1X resolver sin = $\frac{8.1 \times (\text{Step 136} - \text{Step 33})}{\text{Step 135}} = 1\ (\pm 10\%)$
140	OG 1X resolver sin = $\frac{8.1 \times (\text{Step 138} - \text{Step 33})}{\text{Step 139}} = 1\ (\pm 10\%)$
198	Yaw attitude error = $\frac{2.44 \times (\text{Step 197} - \text{Step 33})}{\text{Step 196}} = 1\ (\pm 10\%)$
201	Pitch attitude error = $\frac{2.44 \times (\text{Step 200} - \text{Step 33})}{\text{Step 199}} = 1\ (\pm 10\%)$
204	Roll attitude error = $\frac{2.44 \times (\text{Step 203} - \text{Step 33})}{\text{Step 202}} = 1\ (\pm 10\%)$

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 REV. L PAGE 1 OF 15

INITIAL TDRR 32758 D.S. PGS 9

SUBSYSTEM G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-
C	9-22-67	34705	1, 2, 4	2	EA	-
D	10-12-67	34827	2, 4, 6, 7, 8	-	EA	-
E	11-9-67	35020	1-9	1-3, 5, 7	EA	-
F	1-16-68	35449	7	-	EA	-
G	4-5-68	36040	4, 5	3, 7	EA	-
H	4-29-68	36123	1, 4, 8	5	EA	-
J	6-17-68	36351	1, 4, 5	3	EA	-
K	12-27-68	37152	All	All	EA	-
L	3-11-69	37410	1	-	EA	-

REFERENCES PS 2015000, JDC 12204

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL Decade Inductance, General Radio 1490F or equivalent

IMPORTANT: 1. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

2. Insure that cable W226 is removed and connector assembly (2003099) is connected to CGC test connector before proceeding with this JDC.

NOTE: The items marked with an asterisk (*) are applicable only for SCA P/N 2007035 and are to be omitted for SCA P/N 2007234.

NOTE: Do not command zero optics from a trunnion angle greater than 10°.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in cutout above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly, P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly (observe placarding on bracket assembly for connector locations) and attach with hex nuts

VERIFICATION WITH SIDL REQUIRED BEFORE USE

supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

4. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3, respectively.

5. Perform JDC 12204 to advance system to ISS Operate mode.

6. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.

7. Adjust G&N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28.8 (± 0.25) vdc.

8. Press to light OPTICS POWER ON pushbutton on Test Control panel.

9. Perform following switch settings on applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set -
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to DIRECT
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set -
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to DIRECT
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit of Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last last two digits of Test Selector panel position.

2. Set Test Selector panel to 101 and measure and record 28 vdc CGC operate voltage on DVM. (SCA output.)

3. Set Test Selector panel to 102 and measure and record 28 vdc IMU standby voltage on DVM. (SCA output.)

4. Set Test Selector panel to 203 and measure and record 28 vdc optics operate voltage on DVM. (SCA output.)

CMC WARNING

5. Set Test Selector panel to 204 to monitor +28 vdc CMC warning voltage on DVM.

6. Enter VERB 35 into DSKY and press ENTR pushbutton.

7. Record that CMC lamp on Indicator Control panel lights and then goes out. Record DVM indication after CMC lamp goes out. (SCA otuput.)

PIPA G/S OUTPUT

8. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

9. Insure that CH4AC, CH5AC, and CH6AC pushbuttons on Oscillograph Signal Selector panel are lighted.

10. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 MV/MM and set sensitivity of channel 8 to 5 V/CM. Use ZERO ADJ control to center all traces.

11. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
   VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
   VERB 22 NOUN 22 Flashing
f. -04500 ENTR
g. Observe:
   VERB 23 NOUN 22 Flashing
h. +03500 ENTR

12. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

13. Set Test Selector panel to 117 to monitor Z PIPA G/S in-phase output on channels 4 and 8.

14. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all lamp indications which occur during performance of step 15.

15. Enter VERB 35 into DSKY and press ENTR pushbutton.

16. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds and then closing.

17. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record Z PIPA loop closure test results as satisfactory if loop closure indication on channel 8 (SCA output) corresponds to loop closure indication on channel 4 (SCA input).

18. Set Test Selector panel to 118 to monitor Y PIPA G/S in-phase output on channels 5 and 8.

19. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all lamp indications which occur during performance of step 20.

20. Enter VERB 35 into DSKY and press ENTR pushbutton.

21. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds and then closing.

22. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record Y PIPA loop closure test results as satisfactory if loop closure indication on channel 8 (SCA output) corresponds to loop closure indication on channel 5 (SCA input).

23. Set Test Selector panel to 119 to monitor X PIPA G/S in-phase output on channels 6 and 8.

24. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all lamp indications which occur during performance of step 25.

25. Enter VERB 35 into DSKY and press ENTR pushbutton.

26. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds and then closing.

27. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record X PIPA loop closure test results as satisfactory if loop closure indication on Channel 8 (SCA output) corresponds to loop closure indication on channel 6 (SCA input).

28. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
   VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
   VERB 22 NOUN 22 Flashing
e. -22500 ENTR
f. Observe:
   VERB 23 NOUN 22 Flashing
g. -03500 ENTR

29. Repeat steps 13 through 27 and then set all Oscillograph Amplifier sensitivities to OFF.

POWER SUPPLY AND TEMPERATURE

30. Set CROSSBAR CONTROL on Primary Signal Selector panel to 259 and measure and record 120 vdc PIPA supply voltage on DVM. (SCA input.)

31. Set CROSSBAR CONTROL to 271.

32. Set Test Selector panel to 103 and measure and record 120 vdc PIPA supply voltage on DVM. (SCA output.)

33. Set Test Selector panel to 104 and measure and record 2.5 vdc TM bias voltage on DVM.

34. Set CROSSBAR CONTROL on Primary Signal Selector panel to 123 and measure and record 28 volt 3200 cps supply voltage on DVM. (SCA input.)

35. Set CROSSBAR CONTROL to 271.

36. Set Test Selector panel to 106 and measure and record 28 volt 3200 cps supply voltage on DVM. (SCA output.)

37. Set CROSSBAR CONTROL on Primary Signal Selector panel to 121 and measure and record IMU 28 volt 800 cps 1% supply voltage on DVM. (SCA input.)

38. Set CROSSBAR CONTROL to 271.

39. Set Test Selector panel to 113 and measure and record IMU 28 volt 800 cps 1% supply voltage on DVM. (SCA output.)

*40. Set CROSSBAR CONTROL on Primary Signal Selector panel to 101 and measure and record optics 28 volt 800 cps 1% supply voltage on DVM. (SCA input.)

*41. Set CROSSBAR CONTROL to 271.

*42. Set Test Selector panel to 128 and measure and record optics 28 volt 800 cps 1% supply voltage on DVM. (SCA output.)

43. Set CROSSBAR CONTROL on Primary Signal Selector panel to 255 and measure and record PIPA temperature on DVM. (SCA input.)

44. Set CROSSBAR CONTROL to 271.

45. Set Test Selector panel to 201 and measure and record PIPA temperature on DVM. (SCA output.)

*46. Set CROSSBAR CONTROL on Primary Signal Selector panel to 156 and measure and record IRIG temperature on DVM. (SCA input.)

*47. Set CROSSBAR CONTROL to 271.

*48. Set Test Selector panel to 202 and measure and record IRIG temperature on DVM. (SCA output.)

NOTE: SCM TEST TMC INHIBIT lamp on Temperature Monitor Control panel will light whenever PIPA or IRIG temperature monitor is selected (steps 43 through 48). Ignore lamp indication.

*49. Set CROSSBAR CONTROL on Primary Signal Selector panel to 299.

*50. Connect PSA TPA direct probes to TB4-21 (high) and TB5-22 (low) and measure and record IMU heater current on DVM. (SCA input.)

*51. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

*52. Set Test Selector panel to 150 and measure and record IMU heater current on DVM. (SCA output.)

*53. Set CROSSBAR CONTROL on Primary Signal Selector panel to 299.

NOTE: An indication may or may not be present during performance of steps 54 and 56 depending upon blower cycling.

*54. Connect PSA TPA direct probes to TB4-20 (high) and TB5-33 (low) and measure and record IMU blower current on DVM. (SCA input.)

*55. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

*56. Set Test Selector panel to 151 and measure and record IMU blower current on DVM. (SCA output.)

IG, MG, AND OG SERVO ERRORS

57. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

58. Set switches on Signal Generator as follows:

RANGE to X 0.1
FREQUENCY meter to 2
FUNCTION to SQUARE
DC BALANCE to mid position
AMPLITUDE TO 70

59. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

60. Set FUNCTION control on PAVM to 0° and FREQUENCY control to 3200 ~.

61. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

62. Set CROSSBAR CONTROL on Primary Signal Selector panel to 135 to monitor IG servo error on PAVM.

63. Connect decade inductance to PSA TPA test points TB5-32 (high) and TB5-40 (low).

64. Set GIMBAL SERVO TEST switch on Test Selector panel to 1.

65. Set Test Selector panel to 137.

66. Press to light TEST START pushbutton.

67. Set SCOPE "A" INPUT SIGNAL switch on Primary Signal Selector panel to SIG 1 and SCOPE "A" INPUT REFERENCE switch to 3.

68. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

69. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

70. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low

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voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

71. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

72. Calculate IG servo error SCA output to IG servo error SCA input as follows. Record result:

IG servo error =

$$\frac{\text{Step 70, max meter spread}}{\text{Step 69, max meter spread}} = 0.91\ (\pm 15\%)$$

73. Set CROSSBAR CONTROL on Primary Signal Selector panel to 134 to monitor MG servo error on PAVM.

74. Connect decade inductance to PSA TPA test points TB5-41 (high) and TB5-40 (low).

75. Set GIMBAL SERVO TEST switch on Test Selector panel to 2.

76. Set Test Selector panel to 138.

77. Press to light TEST START pushbutton.

78. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

79. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

80. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

81. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

82. Calculate MG servo error SCA output to MG servo error SCA input as follows. Record result:

MG servo error =

$$\frac{\text{Step 80, max meter spread}}{\text{Step 79, max meter spread}} = 0.91\ (\pm 15\%)$$

83. Set CROSSBAR CONTROL on Primary Signal Selector panel to 133 to monitor OG servo error on PAVM.

84. Connect decade inductance to PSA TPA test points TB5-31 (high) and TB5-40 (low).

85. Set GIMBAL SERVO TEST switch on Test Selector panel to 3.

86. Set Test Selector panel to 139.

87. Press to light TEST START pushbutton.

88. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

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89. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

90. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

91. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

92. Calculate OG servo error SCA output to OG servo error SCA input as follows. Record result:

OG servo error =

$$\frac{\text{Step 90, max meter spread}}{\text{Step 89, max meter spread}} = 0.91\ (\pm 15\%)$$

93. Press to extinguish GIMBAL SERVO TEST pushbutton on Test Selector panel.

IG, MG, AND OG TORQUE MOTOR CURRENTS

*94. Insure that AMPLITUDE control on Signal Generator is set to 0.

*95. Connect jumper between PROBES OUTPUT DIRECT jacks and CH6DC IN jacks on Auxiliary Input panel.

*96. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

*97. Insure that CH6DC indicator is lighted.

*98. Zero Oscillograph channel 6 and set sensitivity to 0.1 V/CM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 trace as near center as possible with a 2.5 vdc bias input.

*99. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

*100. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*101. Set CROSSBAR CONTROL on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.

*102. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

*103. Connect PSA TPA direct probes to TB2-31 (high) and TB1-49 (low) to monitor IG torque motor current on channel 6. (SCA input.)

*104. Set Test Selector panel to 132 and GIMBAL SERVO TEST switch to 1 to monitor IG torque motor current on channel 8. (SCA output.)

*105. Press to light TEST START pushbutton.

*106. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 2 volts peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*107. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*108. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*109. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*110. Connect PSA TPA direct probes to TB2-32 (high) and TB1-49 (low) to monitor MG torque motor current on channel 6. (SCA input.)

*111. Press to light TEST START pushbutton.

*112. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*113. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*114. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*115. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*116. Connect PSA TPA direct probes to TB1-45 (high) and TB1-49 (low) to monitor OG torque motor current on channel 6. (SCA input.)

*117. Press to light TEST START pushbutton.

*118. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*119. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*120. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*121. Set GIMBAL SERVO TEST switch on Test Selector panel to OFF. Set CHART DRIVE switch on Oscillograph Control panel to OFF and set sensitivities on Oscillograph Amplifiers to OFF.

1X RESOLVER SIN AND COS

122. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR

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123. Set CROSSBAR CONTROL on Primary Signal Selector panel to 243 and measure and record IG 1X resolver cos voltage indicated on DVM. (SCA input.)

124. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 amd set Test Selector panel to 120. Measure and record IG 1X resolver cos voltage indicated on DVM. (SCA output.)

125. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:

IG 1X resolver cos =

$$\frac{8.1\ (\text{Step 124} - \text{Step 33})}{\text{Step 123}} = 1\ (\pm 10\%)$$

126. Set Test Selector panel to 121 and measure and record MG 1X resolver cos voltage indicated on DVM. (SCA output.)

127. Set CROSSBAR CONTROL on Primary Signal Selector panel to 242 and measure and record MG 1X resolver cos voltage indicated on DVM. (SCA input.)

128. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:

MG 1X resolver cos =

$$\frac{8.1\ (\text{Step 126} - \text{Step 33})}{\text{Step 127}} = 1\ (\pm 10\%)$$

129. Set CROSSBAR CONTROL on Primary Signal Selector panel to 241 and measure and record OG 1X resolver cos voltage indicated on DVM. (SCA input.)

130. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 122. Measure and record OG 1X resolver cos voltage indicated on DVM. (SCA output.)

131. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:

OG 1X resolver cos =

$$\frac{8.1\ (\text{Step 130} - \text{Step 33})}{\text{Step 129}} = 1\ (\pm 10\%)$$

132. Set Test Selector panel to 123 and measure and record IG 1X resolver sin voltage indicated on DVM. (SCA output.)

133. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (SCA input.)

134. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:

IG 1X resolver sin =

$$\frac{8.1\ (\text{Step 132} - \text{Step 33})}{\text{Step 133}} = 1\ (\pm 10\%)$$

135. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (SCA input.)

136. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 124. Measure and record MG 1X resolver sin voltage indicated on DVM. (SCA output.)

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137. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:

MG 1X resolver sin =

$$\frac{8.1\ (\text{Step 136} - \text{Step 33})}{\text{Step 135}} = 1\ (\pm 10\%)$$

138. Set Test Selector panel to 125 and measure and record OG 1X resolver sin voltage indicated on DVM. (SCA output.)

139. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM (SCA input.)

140. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:

OG 1X resolver sin =

$$\frac{8.1\ (\text{Step 138} - \text{Step 33})}{\text{Step 139}} = 1\ (\pm 10\%)$$

141. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

SHAFT AND TRUNNION CDU FINE ERROR

*142. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

*143. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

*144. Set Test Selector panel to 146 to connect SCA shaft CDU fine error output to DVM.

*145. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*146. Set PAVM switch on Primary Signal Selector panel to AUX.

*147. Connect PSA TPA buffered probes to TB3-23 (high) and TB3-34 (low) to connect SCA shaft CDU fine error input to PAVM.

*148. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

*149. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

*150. Position Optics Hand Controller on Indicator Control panel to the left until PAVM indicates 1.0 vac in-phase. Record SCA output indicated on DVM.

*151. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

*152. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

*153. Set Test Selector panel to 147 to connect SCA trunnion CDU fine error output to DVM.

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*154. Connect PSA TPA buffered probes to TB3-22 (high) and TB3-34 (low) to connect SCA trunnion CDU fine error input to PAVM.

*155. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

*156. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

*157. Position Optics Hand Controller on Indicator Control panel to a down position until PAVM indicates 0.64 vac in-phase. Record SCA output indicated on DVM.

*158. Perform following DSKY operations:
a. VERB 36 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00200 ENTR
e. VERB 21 NOUN 10 ENTR
f. 00012 ENTR
g. 00202 ENTR
h. VERB 21 NOUN 01 ENTR
i. 00053 ENTR
j. 40000 ENTR
k. VERB 21 NOUN 01 ENTR
l. 00054 ENTR
m. 40000 ENTR
n. VERB 21 NOUN 10 ENTR
o. 00014 ENTR
p. 06000 ENTR

*159. Set Test Selector panel to 126 and measure and record SCA trunnion CDU DAC output indicated on DVM.

*160. Set Test Selector panel to 127 and measure and record SCA shaft CDU DAC output indicated on DVM.

*161. Perform following DSKY operations:
a. VERB 36 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00200 ENTR
e. VERB 21 NOUN 10 ENTR
f. 00012 ENTR
g. 00202 ENTR
h. VERB 21 NOUN 01 ENTR
i. 00053 ENTR
j. 37777 ENTR
k. VERB 21 NOUN 01 ENTR
l. 00054 ENTR
m. 37777 ENTR
n. VERB 21 NOUN 10 ENTR
o. 00014 ENTR
p. 06000 ENTR

*162. Set Test Selector panel to 126 and measure and record SCA trunnion CDU DAC output indicated on DVM.

*163. Set Test Selector panel to 127 and measure and record SCA shaft CDU DAC output indicated on DVM.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

*164. Set Test Selector panel to 129.

*165. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

*166. Zero Oscillograph channel 1 and set sensitivity to 20 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*167. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

*168. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS ZERO switch (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

*169. Hold Optics Hand Controller to left limit not longer than 20 seconds.

*170. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

*171. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph channel 8.

*172. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to connect SCA SCT shaft tach input to channel 1.

*173. Zero Oscillograph channel 1 and set sensitivity to 200 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*174. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*175. Set OPTICS SPEED switch on Indicator Control panel to HI.

*176. Hold Optics Hand Controller to right limit for approximately 20 seconds.

*177. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

*178. Set Test Selector panel to 130 to connect SCA SXT trunnion tach output to Oscillograph channel 8.

*179. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 to connect SCA SXT trunnion tach input to Oscillograph channel 2.

*180. Zero Oscillograph channel 2 and set sensitivity to 20 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*181. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*182. Set OPTICS SPEED switch on Indicator Control panel to MED.

*183. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

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*184. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

*185. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph channel 8.

*186. Set CHANNEL 5 switch on Oscillograph Signal Selector panel to 11 to connect SCA SCT trunnion tach input to Oscillograph channel 5.

*187. Insure that CH5AC indicator on Oscillograph Signal Selector panel is lighted.

*188. Zero Oscillograph channel 5 and set sensitivity to 50 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*189. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*190. Set OPTICS SPEED switch on Indicator Control panel to HI.

*191. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

*192. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set sensitivities on Oscillograph Amplifiers to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

*193. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 21 NOUN 10 ENTR
i. 00012 ENTR
j. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during performance of step 194. Ignore lamp indication.

*194. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

*195. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM switch on Primary Signal Selector panel to AUX.

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*196. Connect PSA TPA direct probes to TB4-44 (high) and TB4-48 (low) and measure and record SCA yaw attitude error input indicated on PAVM.

*197. Set Test Selector panel to 114 and measure and record SCA yaw attitude error output indicated on DVM.

*198. Calculate SCA yaw attitude error output to SCA yaw attitude error input as follows. Record result:

Yaw attitude error =

$$\frac{2.44\ (\text{Step 197} - \text{Step 33})}{\text{Step 196}} = 1\ (\pm 10\%)$$

*199. Connect PSA TPA direct probes to TB4-45 (high) and TB4-49 (low) and measure and record SCA pitch attitude error input indicated on PAVM.

*200. Set Test Selector panel to 115 and measure and record SCA pitch attitude error output indicated on DVM.

*201. Calculate SCA pitch attitude error output to SCA pitch attitude error input as follows. Record result:

Pitch attitude error =

$$\frac{2.44\ (\text{Step 200} - \text{Step 33})}{\text{Step 199}} = 1\ (\pm 10\%)$$

*202. Connect PSA TPA direct probes to TB4-43 (high) and TB4-47 (low) and measure and record SCA roll attitude error input indicated on PAVM.

*203. Set Test Selector panel to 116 and measure and record SCA roll attitude error output indicated on DVM.

*204. Calculate SCA roll attitude error output to SCA roll attitude error input as follows. Record result:

Roll attitude error =

$$\frac{2.44\ (\text{Step 203} - \text{Step 33})}{\text{Step 202}} = 1\ (\pm 10\%)$$

205. Perform JDC 12204 to turn off G & N system.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

NO. 12224 JDC
REV L
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2	28 vdc CGC operate	vdc	3.9		4.9		
3	28 vdc IMU standby	vdc	3.9		4.9		
4	28 vdc optics operate	vdc	3.9		4.9		
7	Lamp operation	▨	▨		▨		
	CMC warning voltage	vdc	3.9		4.9		
17	Z PIPA loop closure	▨	▨		▨		
22	Y PIPA loop closure	▨	▨		▨		
27	X PIPA loop closure	▨	▨		▨		

APOLLO G&N
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JDC NO. 12224
REV L

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29(17)	Z PIPA loop closure	▨	▨		▨		
29(22)	Y PIPA loop closure	▨	▨		▨		
29(27)	X PIPA loop closure	▨	▨		▨		
30	120 vdc PIPA supply	vdc	▨		▨	▨	▨
32	120 vdc PIPA supply	vdc	2.3		4.7		
33	2.5 vdc TM bias	vdc	2.45		2.55		
34	3200 cps 28 volts	vac	▨		▨	▨	▨
36	3200 cps 28 volts	vdc	4.2		4.8		
37	800 cps 28 volts 1% IMU	vac	▨		▨	▨	▨
39	800 cps 28 volts 1% IMU	vdc	4.2		4.8		
40	800 cps 28 volts 1% optics	vac	▨		▨	▨	▨
42	800 cps 28 volts 1% optics	vdc	4.2		4.8		
43	PIPA temperature	vdc	▨		▨	▨	▨

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JDC NO. 12224
REV L

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
45	PIPA temperature	vdc	2.0		3.5		
46	IRIG temperature	vdc	▨		▨	▨	▨
48	IRIG temperature	vdc	2.37		3.75		
50	IMU heater current	vdc	▨		▨	▨	▨
52	IMU heater current	vdc	3.9		4.8		
54	IMU blower current	vdc	▨		▨	▨	▨
56	IMU blower current	vdc	4.0		4.6		
69	Maximum right	vac	▨		▨	▨	▨
	Maximum left	vac	▨		▨	▨	▨
	Maximum meter spread	vac	▨		▨	▨	▨
70	High voltage	vdc	▨		▨	▨	▨
	Low voltage	vdc	▨		▨	▨	▨
	Maximum meter spread	vdc	▨		▨	▨	▨
72	IG servo error	▨	0.7735		1.0465		
79	Maximum right	vac	▨		▨	▨	▨
	Maximum left	vac	▨		▨	▨	▨
	Maximum meter spread	vac	▨		▨	▨	▨
80	High voltage	vdc	▨		▨	▨	▨

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JDC NO. 12224
REV L

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
80 (cont)	Low voltage	vdc	▨		▨	▨	▨
	Maximum meter spread	vdc	▨		▨	▨	▨
82	MG servo error	▨	0.7735		1.0465		
89	Maximum right	vac	▨		▨	▨	▨
	Maximum left	vac	▨		▨	▨	▨
	Maximum meter spread	vac	▨		▨	▨	▨
90	High voltage	vdc	▨		▨	▨	▨
	Low voltage	vdc	▨		▨	▨	▨
	Maximum meter spread	vdc	▨		▨	▨	▨
92	OG servo error	▨	0.7735		1.0465		
108	IG torque motor current (channel 6)	Δv	▨		▨	▨	▨
	IG torque motor current (channel 8)	Δv	channel 6 x 4		channel 6 x 6		
114	MG torque motor current (channel 6)	Δv	▨		▨	▨	▨
	MG torque motor current (channel 8)	Δv	channel 6 x 4		channel 6 x 6		
120	OG torque motor current (channel 6)	Δv	▨		▨	▨	▨

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JDC NO. 12224
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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
120 (cont)	OG torque motor current (channel 8)	Δv	channel 6 x 1.8		channel 6 x 3.8		
123	IG 1X resolver cos	vac	▨		▨	▨	▨
124	IG 1X resolver cos	vdc	▨		▨	▨	▨
125	IG 1X resolver cos	▨	0.90		1.10		
126	MG 1X resolver cos	vdc	▨		▨	▨	▨
127	MG 1X resolver cos	vac	▨		▨	▨	▨
128	MG 1X resolver cos	▨	0.90		1.10		
129	OG 1X resolver cos	vac	▨		▨	▨	▨
130	OG 1X resolver cos	vdc	▨		▨	▨	▨
131	OG 1X resolver cos	▨	0.90		1.10		
132	IG 1X resolver sin	vdc	▨		▨	▨	▨
133	IG 1X resolver sin	vac	▨		▨	▨	▨
134	IG 1X resolver sin	▨	0.90		1.10		
135	MG 1X resolver sin	vac	▨		▨	▨	▨
136	MG 1X resolver sin	vdc	▨		▨	▨	▨
137	MG 1X resolver sin	▨	0.90		1.10		

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JDC
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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
138	OG 1X resolver sin	vdc	▨		▨	▨	▨
139	OG 1X resolver sin	vac	▨		▨	▨	▨
140	OG 1X resolver sin	▨	0.90		1.10		
150	Shaft CDU fine error	vdc	4.35		4.81		
157	Trunnion CDU fine error	vdc	4.35		4.81		
159	Trunnion CDU DAC output	vdc	4.00		5.00		
160	Shaft CDU DAC output	vdc	4.00		5.00		
162	Trunnion CDU DAC output	vdc	0.00		1.00		
163	Shaft CDU DAC output	vdc	0.00		1.00		
170	SCA input (channel 1)	Δ v	▨		▨	▨	▨
	SCA output (channel 8)	Δ v	channel 1 x 4.0		channel 1 x 6.0		
177	SCA input (channel 1)	Δ v	▨		▨	▨	▨
	SCA output (channel 8)	Δ v	channel 1 x 0.4		channel 1 x 0.6		

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JDC
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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
184	SCA input (channel 2)	Δ v	▨		▨	▨	▨
	SCA output (channel 8)	Δ v	channel 2 x 4.0		channel 2 x 6.0		
192	SCA input (channel 5)	Δ v	▨		▨	▨	▨
	SCA output (channel 8)	Δ v	channel 5 x 0.4		channel 5 x 0.6		
196	Yaw attitude error	vac	▨		▨	▨	▨
197	Yaw attitude error	vdc	▨		▨	▨	▨
198	Yaw attitude error	▨	0.90		1.10		
199	Pitch attitude error	vac	▨		▨	▨	▨
200	Pitch attitude error	vdc	▨		▨	▨	▨
201	Pitch attitude error	▨	0.90		1.10		
202	Roll attitude error	vac	▨		▨	▨	▨
203	Roll attitude error	vdc	▨		▨	▨	▨
204	Roll attitude error	▨	0.90		1.10		

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JDC
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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
72	IG servo error = $\frac{\text{Step 70, max meter spread}}{\text{Step 69, max meter spread}}$ = 0.91 (±15%)
82	MG servo error = $\frac{\text{Step 80, max meter spread}}{\text{Step 79, max meter spread}}$ = 0.91 (±15%)
92	OG servo error = $\frac{\text{Step 90, max meter spread}}{\text{Step 89, max meter spread}}$ = 0.91 (±15%)
125	IG 1X resolver cos = $\frac{8.1 \times (\text{Step 124 - Step 33})}{\text{Step 123}}$ = 1 (±10%)
128	MG 1X resolver cos = $\frac{8.1 \times (\text{Step 126 - Step 33})}{\text{Step 127}}$ = 1 (±10%)
131	OG 1X resolver cos = $\frac{8.1 \times (\text{Step 130 - Step 33})}{\text{Step 129}}$ = 1 (±10%)
134	IG 1X resolver sin = $\frac{8.1 \times (\text{Step 132 - Step 33})}{\text{Step 133}}$ = 1 (±10%)

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FORM 00148
Chg. 7-23-65

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JDC
NO. 12224
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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
137	MG 1X resolver sin = $\frac{8.1 \times (\text{Step 136 - Step 33})}{\text{Step 135}}$ = 1 (±10%)
140	OG 1X resolver sin = $\frac{8.1 \times (\text{Step 138 - Step 33})}{\text{Step 139}}$ = 1 (±10%)
198	Yaw attitude error = $\frac{2.44 \times (\text{Step 197 - Step 33})}{\text{Step 196}}$ = 1 (±10%)
201	Pitch attitude error = $\frac{2.44 \times (\text{Step 200 - Step 33})}{\text{Step 199}}$ = 1 (±10%)
204	Roll attitude error = $\frac{2.44 \times (\text{Step 203 - Step 33})}{\text{Step 202}}$ = 1 (±10%)

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FORM 00148
Chg. 7-23-65

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT
JDC 12224 REV. M PAGE 1 OF 15
INITIAL TDRR 32758 D.S. PGS 9
SUBSYSTEM G & N SYSTEM
ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G & N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	8-10-67	34330	All	All	EA	-
B	9-6-67	34560	1	-	EA	-
C	9-22-67	34705	1, 2, 4	2	EA	-
D	10-12-67	34827	2, 4, 6, 7, 8	-	EA	-
E	11-9-67	35020	1-9	1-3, 5, 7	EA	-
F	1-16-68	35449	7	-	EA	-
G	4-5-68	36040	4, 5	3, 7	EA	-
H	4-29-68	36123	1, 4, 8	5	EA	-
J	6-17-68	36351	1, 4, 5	3	EA	-
K	12-27-68	37152	All	All	EA	-
L	3-11-69	37410	1	-	EA	-
M	5-26-70	38134	1, 15	-	EA	-

REFERENCES PS 2015000
JDC 12204

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL Decade Inductance, General Radio 1490F or equivalent

IMPORTANT: 1. Avoid slewing of SXT shaft and trunnion axes into their mechanical stops.

2. Insure that cable W226 is removed and connector assembly (2003099) or Restart Monitor module (2898989) is connected to CGC test connector before proceeding with this JDC.

NOTE: The items marked with an asterisk (*) are applicable only for SCA P/N 2007035 and are to be omitted for SCA P/N 2007234.

NOTE: Do not command zero optics from a trunnion angle greater than 10°.

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

2. Position SCA in cutout above DSKY on right side of cradle front panel assembly with SCA connectors facing bracket assembly P/N 2900919, and attach with six captive screws. Torque screws finger tight.

3. Position SCA Deutsch connectors J1, J2, and J3 in bracket assembly (observe placarding on bracket assembly for connector locations) and attach with hex nuts

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT
JDC 12224 REV M PAGE 2 OF 15
SUBSYSTEM G & N SYSTEM
ASSY

supplied with each connector. Torque hex nuts finger tight.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

4. Connect GNF harness connectors P7, P8, and P9 to SCA connectors J2, J1, and J3, respectively.

5. Perform JDC 12204 to advance system to ISS Operate mode.

6. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.

7. Adjust G&N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28.8 (±0.25) vdc.

8. Press to light OPTICS POWER ON pushbutton on Test Control panel.

9. Perform following switch settings on applicable Indicator Control panel:

a. On Indicator Control panel 2021290 only set -
   (1) OPTICS ZERO to OFF then to ZERO
   (2) OPTICS TEL TRUN to SLAVE TO SXT
   (3) OPTICS COUPLING to DIRECT
   (4) OPTICS MODE to MAN
   (5) OPTICS SPEED to LO

b. On all Indicator Control panels except 2021290 set -
   (1) OPTICS MODE to MAN then to ZERO
   (2) OPTICS CONTROLLER SPEED to LO
   (3) OPTICS CONTROLLER COUPLING to DIRECT
   (4) OPTICS TRACKER to OFF
   (5) OPTICS TELESCOPE TRUNNION to SLAVE TO SXT

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit of Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last last two digits of Test Selector panel position.

2. Set Test Selector panel to 101 and measure and record 28 vdc CGC operate voltage on DVM. (SCA output.)

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT
JDC 12224 REV M PAGE 3 OF 15
SUBSYSTEM G & N SYSTEM
ASSY

3. Set Test Selector panel to 102 and measure and record 28 vdc IMU standby voltage on DVM. (SCA output.)

4. Set Test Selector panel to 203 and measure and record 28 vdc optics operate voltage on DVM. (SCA output.)

CMC WARNING

5. Set Test Selector panel to 204 to monitor +28 vdc CMC warning voltage on DVM.

6. Enter VERB 35 into DSKY and press ENTR pushbutton.

7. Record that CMC lamp on Indicator Control panel lights and then goes out. Record DVM indication after CMC lamp goes out. (SCA otuput.)

PIPA G/S OUTPUT

8. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA G/S output
CHANNEL 5 to 1	Y PIPA G/S output
CHANNEL 6 to 1	X PIPA G/S output
CHANNEL 8 to 4	SCA GDB stepper switch

9. Insure that CH4AC, CH5AC, and CH6AC pushbuttons on Oscillograph Signal Selector panel are lighted.

10. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 MV/MM and set sensitivity of channel 8 to 5 V/CM. Use ZERO ADJ control to center all traces.

11. Perform following DSKY operations:

a.	VERB 36		ENTR
b.	VERB 41	NOUN 20	ENTR
c.	Observe:		
	VERB 21	NOUN 22	Flashing
d.	+00000		ENTR
e.	Observe:		
	VERB 22	NOUN 22	Flashing
f.	-04500		ENTR
g.	Observe:		
	VERB 23	NOUN 22	Flashing
h.	+03500		ENTR

12. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

13. Set Test Selector panel to 117 to monitor Z PIPA G/S in-phase output on channels 4 and 8.

14. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all lamp indications which occur during performance of step 15.

15. Enter VERB 35 into DSKY and press ENTR pushbutton.

16. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds and then closing.

17. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record Z PIPA loop closure test results as satisfactory if loop closure indication on channel 8 (SCA output) corresponds to loop closure indication on channel 4 (SCA input).

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JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT
JDC 12224 REV M PAGE 4 OF 15
SUBSYSTEM G & N SYSTEM
ASSY

18. Set Test Selector panel to 118 to monitor Y PIPA G/S in-phase output on channels 5 and 8.

19. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all lamp indications which occur during performance of step 20.

20. Enter VERB 35 into DSKY and press ENTR pushbutton.

21. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds and then closing.

22. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record Y PIPA loop closure test results as satisfactory if loop closure indication on channel 8 (SCA output) corresponds to loop closure indication on channel 5 (SCA input).

23. Set Test Selector panel to 119 to monitor X PIPA G/S in-phase output on channels 6 and 8.

24. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all lamp indications which occur during performance of step 25.

25. Enter VERB 35 into DSKY and press ENTR pushbutton.

26. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds and then closing.

27. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record X PIPA loop closure test results as satisfactory if loop closure indication on Channel 8 (SCA output) corresponds to loop closure indication on channel 6 (SCA input).

28. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe:		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe:		
	VERB 22	NOUN 22	Flashing
e.	-22500		ENTR
f.	Observe:		
	VERB 23	NOUN 22	Flashing
g.	-03500		ENTR

29. Repeat steps 13 through 27 and then set all Oscillograph Amplifier sensitivities to OFF.

POWER SUPPLY AND TEMPERATURE

30. Set CROSSBAR CONTROL on Primary Signal Selector panel to 259 and measure and record 120 vdc PIPA supply voltage on DVM. (SCA input.)

31. Set CROSSBAR CONTROL to 271.

32. Set Test Selector panel to 103 and measure and record 120 vdc PIPA supply voltage on DVM. (SCA output.)

33. Set Test Selector panel to 104 and measure and record 2.5 vdc TM bias voltage on DVM.

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34. Set CROSSBAR CONTROL on Primary Signal Selector panel to 123 and measure and record 28 volt 3200 cps supply voltage on DVM. (SCA input.)

35. Set CROSSBAR CONTROL to 271.

36. Set Test Selector panel to 106 and measure and record 28 volt 3200 cps supply voltage on DVM. (SCA output.)

37. Set CROSSBAR CONTROL on Primary Signal Selector panel to 121 and measure and record IMU 28 volt 800 cps 1% supply voltage on DVM. (SCA input.)

38. Set CROSSBAR CONTROL to 271.

39. Set Test Selector panel to 113 and measure and record IMU 28 volt 800 cps 1% supply voltage on DVM. (SCA output.)

*40. Set CROSSBAR CONTROL on Primary Signal Selector panel to 101 and measure and record optics 28 volt 800 cps 1% supply voltage on DVM. (SCA input.)

*41. Set CROSSBAR CONTROL to 271.

*42. Set Test Selector panel to 128 and measure and record optics 28 volt 800 cps 1% supply voltage on DVM. (SCA output.)

43. Set CROSSBAR CONTROL on Primary Signal Selector panel to 255 and measure and record PIPA temperature on DVM. (SCA input.)

44. Set CROSSBAR CONTROL to 271.

45. Set Test Selector panel to 201 and measure and record PIPA temperature on DVM. (SCA output.)

*46. Set CROSSBAR CONTROL on Primary Signal Selector panel to 156 and measure and record IRIG temperature on DVM. (SCA input.)

*47. Set CROSSBAR CONTROL to 271.

*48. Set Test Selector panel to 202 and measure and record IRIG temperature on DVM. (SCA output.)

NOTE: SCM TEST TMC INHIBIT lamp on Temperature Monitor Control panel will light whenever PIPA or IRIG temperature monitor is selected (steps 43 through 48). Ignore lamp indication.

*49. Set CROSSBAR CONTROL on Primary Signal Selector panel to 299.

*50. Connect PSA TPA direct probes to TB4-21 (high) and TB5-22 (low) and measure and record IMU heater current on DVM. (SCA input.)

*51. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

*52. Set Test Selector panel to 150 and measure and record IMU heater current on DVM. (SCA output.)

*53. Set CROSSBAR CONTROL on Primary Signal Selector panel to 299.

NOTE: An indication may or may not be present during performance of steps 54 and 56 depending upon blower cycling.

*54. Connect PSA TPA direct probes to TB4-20 (high) and TB5-33 (low) and measure and record IMU blower current on DVM. (SCA input.)

*55. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

*56. Set Test Selector panel to 151 and measure and record IMU blower current on DVM. (SCA output.)

IG, MG, AND OG SERVO ERRORS

57. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

58. Set switches on Signal Generator as follows:

RANGE to X 0.1
FREQUENCY meter to 2
FUNCTION to SQUARE
DC BALANCE to mid position
AMPLITUDE TO 70

59. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

60. Set FUNCTION control on PAVM to 0^{o} and FREQUENCY control to 3200 ~.

61. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

62. Set CROSSBAR CONTROL on Primary Signal Selector panel to 135 to monitor IG servo error on PAVM.

63. Connect decade inductance to PSA TPA test points TB5-32 (high) and TB5-40 (low).

64. Set GIMBAL SERVO TEST switch on Test Selector panel to 1.

65. Set Test Selector panel to 137.

66. Press to light TEST START pushbutton.

67. Set SCOPE "A" INPUT SIGNAL switch on Primary Signal Selector panel to SIG 1 and SCOPE "A" INPUT REFERENCE switch to 3.

68. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

69. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

70. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low

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voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

71. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

72. Calculate IG servo error SCA output to IG servo error SCA input as follows.

Record result:

IG servo error =

$$\frac{\text{Step 70, max meter spread}}{\text{Step 69, max meter spread}} = 0.91\ (\pm 15\%)$$

73. Set CROSSBAR CONTROL on Primary Signal Selector panel to 134 to monitor MG servo error on PAVM.

74. Connect decade inductance to PSA TPA test points TB5-41 (high) and TB5-40 (low).

75. Set GIMBAL SERVO TEST switch on Test Selector panel to 2.

76. Set Test Selector panel to 138.

77. Press to light TEST START pushbutton.

78. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

79. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

80. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

81. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

82. Calculate MG servo error SCA output to MG servo error SCA input as follows.

Record result:

MG servo error =

$$\frac{\text{Step 80, max meter spread}}{\text{Step 79, max meter spread}} = 0.91\ (\pm 15\%)$$

83. Set CROSSBAR CONTROL on Primary Signal Selector panel to 133 to monitor OG servo error on PAVM.

84. Connect decade inductance to PSA TPA test points TB5-31 (high) and TB5-40 (low).

85. Set GIMBAL SERVO TEST switch on Test Selector panel to 3.

86. Set Test Selector panel to 139.

87. Press to light TEST START pushbutton.

88. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

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89. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

90. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

91. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

92. Calculate OG servo error SCA output to OG servo error SCA input as follows.

Record result:

OG servo error =

$$\frac{\text{Step 90, max meter spread}}{\text{Step 89, max meter spread}} = 0.91\ (\pm 15\%)$$

93. Press to extinguish GIMBAL SERVO TEST pushbutton on Test Selector panel.

IG, MG, AND OG TORQUE MOTOR CURRENTS

*94. Insure that AMPLITUDE control on Signal Generator is set to 0.

*95. Connect jumper between PROBES OUTPUT DIRECT jacks and CH6DC IN jacks on Auxiliary Input panel.

*96. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

*97. Insure that CH6DC indicator is lighted.

*98. Zero Oscillograph channel 6 and set sensitivity to 0.1 V/CM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 trace as near center as possible with a 2.5 vdc bias input.

*99. Set FREQUENCY meter on Signal Generator to 1 and RANGE switch to X1.

*100. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*101. Set CROSSBAR CONTROL on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.

*102. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

*103. Connect PSA TPA direct probes to TB2-31 (high) and TB1-49 (low) to monitor IG torque motor current on channel 6. (SCA input.)

*104. Set Test Selector panel to 132 and GIMBAL SERVO TEST switch to 1 to monitor IG torque motor current on channel 8. (SCA output.)

*105. Press to light TEST START pushbutton.

*106. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 2 volts peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*107. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*108. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*109. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*110. Connect PSA TPA direct probes to TB2-32 (high) and TB1-49 (low) to monitor MG torque motor current on channel 6. (SCA input.)

*111. Press to light TEST START pushbutton.

*112. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*113. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*114. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*115. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*116. Connect PSA TPA direct probes to TB1-45 (high) and TB1-49 (low) to monitor OG torque motor current on channel 6. (SCA input.)

*117. Press to light TEST START pushbutton.

*118. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*119. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*120. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*121. Set GIMBAL SERVO TEST switch on Test Selector panel to OFF. Set CHART DRIVE switch on Oscillograph Control panel to OFF and set sensitivities on Oscillograph Amplifiers to OFF.

1X RESOLVER SIN AND COS

122. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
  VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe:
  VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe:
  VERB 23 NOUN 22 Flashing
g. +04500 ENTR

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123. Set CROSSBAR CONTROL on Primary Signal Selector panel to 243 and measure and record IG 1X resolver cos voltage indicated on DVM. (SCA input.)

124. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 amd set Test Selector panel to 120. Measure and record IG 1X resolver cos voltage indicated on DVM. (SCA output.)

125. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:

IG 1X resolver cos =

$$\frac{8.1\ (\text{Step } 124 - \text{Step } 33)}{\text{Step } 123} = 1\ (\pm 10\%)$$

126. Set Test Selector panel to 121 and measure and record MG 1X resolver cos voltage indicated on DVM. (SCA output.)

127. Set CROSSBAR CONTROL on Primary Signal Selector panel to 242 and measure and record MG 1X resolver cos voltage indicated on DVM. (SCA input.)

128. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:

MG 1X resolver cos =

$$\frac{8.1\ (\text{Step } 126 - \text{Step } 33)}{\text{Step } 127} = 1\ (\pm 10\%)$$

129. Set CROSSBAR CONTROL on Primary Signal Selector panel to 241 and measure and record OG 1X resolver cos voltage indicated on DVM. (SCA input.)

130. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 122. Measure and record OG 1X resolver cos voltage indicated on DVM. (SCA output.)

131. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:

OG 1X resolver cos =

$$\frac{8.1\ (\text{Step } 130 - \text{Step } 33)}{\text{Step } 129} = 1\ (\pm 10\%)$$

132. Set Test Selector panel to 123 and measure and record IG 1X resolver sin voltage indicated on DVM. (SCA output.)

133. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (SCA input.)

134. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:

IG 1X resolver sin =

$$\frac{8.1\ (\text{Step } 132 - \text{Step } 33)}{\text{Step } 133} = 1\ (\pm 10\%)$$

135. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (SCA input.)

136. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 124. Measure and record MG 1X resolver sin voltage indicated on DVM. (SCA output.)

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137. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:

MG 1X resolver sin =

$$\frac{8.1\ (\text{Step } 136 - \text{Step } 33)}{\text{Step } 135} = 1\ (\pm 10\%)$$

138. Set Test Selector panel to 125 and measure and record OG 1X resolver sin voltage indicated on DVM. (SCA output.)

139. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM (SCA input.)

140. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:

OG 1X resolver sin =

$$\frac{8.1\ (\text{Step } 138 - \text{Step } 33)}{\text{Step } 139} = 1\ (\pm 10\%)$$

141. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
  VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
  VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
  VERB 23 NOUN 22 Flashing
g. +00000 ENTR

SHAFT AND TRUNNION CDU FINE ERROR

*142. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

*143. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

*144. Set Test Selector panel to 146 to connect SCA shaft CDU fine error output to DVM.

*145. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*146. Set PAVM switch on Primary Signal Selector panel to AUX.

*147. Connect PSA TPA buffered probes to TB3-23 (high) and TB3-34 (low) to connect SCA shaft CDU fine error input to PAVM.

*148. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

*149. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

*150. Position Optics Hand Controller on Indicator Control panel to the left until PAVM indicates 1.0 vac in-phase. Record SCA output indicated on DVM.

*151. Set OPTICS ZERO switch on Indicator Control panel 2021290 to ZERO. On all Indicator Control panels except 2021290, set OPTICS MODE switch to ZERO.

*152. Enter VERB 06 NOUN 55 into DSKY and press ENTR pushbutton.

*153. Set Test Selector panel to 147 to connect SCA trunnion CDU fine error output to DVM.

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*154. Connect PSA TPA buffered probes to TB3-22 (high) and TB3-34 (low) to connect SCA trunnion CDU fine error input to PAVM.

*155. Set OPTICS ZERO switch on Indicator Control panel (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

*156. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

*157. Position Optics Hand Controller on Indicator Control panel to a down position until PAVM indicates 0.64 vac in-phase. Record SCA output indicated on DVM.

*158. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00200 ENTR
e. VERB 21 NOUN 10 ENTR
f. 00012 ENTR
g. 00202 ENTR
h. VERB 21 NOUN 01 ENTR
i. 00053 ENTR
j. 40000 ENTR
k. VERB 21 NOUN 01 ENTR
l. 00054 ENTR
m. 40000 ENTR
n. VERB 21 NOUN 10 ENTR
o. 00014 ENTR
p. 06000 ENTR

*159. Set Test Selector panel to 126 and measure and record SCA trunnion CDU DAC output indicated on DVM.

*160. Set Test Selector panel to 127 and measure and record SCA shaft CDU DAC output indicated on DVM.

*161. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00200 ENTR
e. VERB 21 NOUN 10 ENTR
f. 00012 ENTR
g. 00202 ENTR
h. VERB 21 NOUN 01 ENTR
i. 00053 ENTR
j. 37777 ENTR
k. VERB 21 NOUN 01 ENTR
l. 00054 ENTR
m. 37777 ENTR
n. VERB 21 NOUN 10 ENTR
o. 00014 ENTR
p. 06000 ENTR

*162. Set Test Selector panel to 126 and measure and record SCA trunnion CDU DAC output indicated on DVM.

*163. Set Test Selector panel to 127 and measure and record SCA shaft CDU DAC output indicated on DVM.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

*164. Set Test Selector panel to 129.

*165. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCA GDB stepper switch

*166. Zero Oscillograph channel 1 and set sensitivity to 20 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*167. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

*168. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS ZERO switch (Indicator Control panel 2021290 only) to OFF and set OPTICS MODE switch to MAN.

*169. Hold Optics Hand Controller to left limit not longer than 20 seconds.

*170. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT shaft tach input and output signals monitored on channels 1 and 8.

*171. Set Test Selector panel to 148 to connect SCA SCT shaft tach output to Oscillograph channel 8.

*172. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 13 to connect SCA SCT shaft tach input to channel 1.

*173. Zero Oscillograph channel 1 and set sensitivity to 200 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*174. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*175. Set OPTICS SPEED switch on Indicator Control panel to HI.

*176. Hold Optics Hand Controller to right limit for approximately 20 seconds.

*177. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SCT shaft tach input and output signals monitored on channels 1 and 8.

*178. Set Test Selector panel to 130 to connect SCA SXT trunnion tach output to Oscillograph channel 8.

*179. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 12 to connect SCA SXT trunnion tach input to Oscillograph channel 2.

*180. Zero Oscillograph channel 2 and set sensitivity to 20 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*181. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*182. Set OPTICS SPEED switch on Indicator Control panel to MED.

*183. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

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*184. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCA SXT trunnion tach input and output signals monitored on channels 2 and 8.

*185. Set Test Selector panel to 149 to connect SCA SCT trunnion tach output to Oscillograph channel 8.

*186. Set CHANNEL 5 switch on Oscillograph Signal Selector panel to 11 to connect SCA SCT trunnion tach input to Oscillograph channel 5.

*187. Insure that CH5AC indicator on Oscillograph Signal Selector panel is lighted.

*188. Zero Oscillograph channel 5 and set sensitivity to 50 MV/MM. Set sensitivity of channel 8 to 1 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

*189. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*190. Set OPTICS SPEED switch on Indicator Control panel to HI.

*191. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

*192. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Set sensitivities on Oscillograph Amplifiers to OFF. Record SCA SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

*193. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 21 NOUN 10 ENTR
i. 00012 ENTR
j. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during performance of step 194. Ignore lamp indication.

*194. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

*195. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM switch on Primary Signal Selector panel to AUX.

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*196. Connect PSA TPA direct probes to TB4-44 (high) and TB4-48 (low) and measure and record SCA yaw attitude error input indicated on PAVM.

*197. Set Test Selector panel to 114 and measure and record SCA yaw attitude error output indicated on DVM.

*198. Calculate SCA yaw attitude error output to SCA yaw attitude error input as follows. Record result:

Yaw attitude error =

$$\frac{2.44\ (\text{Step 197} - \text{Step 33})}{\text{Step 196}} = 1\ (\pm 10\%)$$

*199. Connect PSA TPA direct probes to TB4-45 (high) and TB4-49 (low) and measure and record SCA pitch attitude error input indicated on PAVM.

*200. Set Test Selector panel to 115 and measure and record SCA pitch attitude error output indicated on DVM.

*201. Calculate SCA pitch attitude error output to SCA pitch attitude error input as follows. Record result:

Pitch attitude error =

$$\frac{2.44\ (\text{Step 200} - \text{Step 33})}{\text{Step 199}} = 1\ (\pm 10\%)$$

*202. Connect PSA TPA direct probes to TB4-43 (high) and TB4-47 (low) and measure and record SCA roll attitude error input indicated on PAVM.

*203. Set Test Selector panel to 116 and measure and record SCA roll attitude error output indicated on DVM.

*204. Calculate SCA roll attitude error output to SCA roll attitude error input as follows. Record result:

Roll attitude error =

$$\frac{2.44\ (\text{Step 203} - \text{Step 33})}{\text{Step 202}} = 1\ (\pm 10\%)$$

NOTE: Step 205 applies only when Restart Monitor module (2898989) is installed.

205. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

206. Perform JDC 12204 to turn off G & N system.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC NO. 12224
REV M
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
2	28 vdc CGC operate	vdc	3.9		4.9		
3	28 vdc IMU standby	vdc	3.9		4.9		
4	28 vdc optics operate	vdc	3.9		4.9		
7	Lamp operation	▨	▨		▨		
	CMC warning voltage	vdc	3.9		4.9		
17	Z PIPA loop closure	▨	▨		▨		
22	Y PIPA loop closure	▨	▨		▨		
27	X PIPA loop closure	▨	▨		▨		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC
NO. 12224
REV. M

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
29(17)	Z PIPA loop closure	▨	▨		▨		
29(22)	Y PIPA loop closure	▨	▨		▨		
29(27)	X PIPA loop closure	▨	▨		▨		
30	120 vdc PIPA supply	vdc	▨		▨	▨	▨
32	120 vdc PIPA supply	vdc	2.3		4.7		
33	2.5 vdc TM bias	vdc	2.45		2.55		
34	3200 cps 28 volts	vac	▨		▨	▨	▨
36	3200 cps 28 volts	vdc	4.2		4.8		
37	800 cps 28 volts 1% IMU	vac	▨		▨	▨	▨
39	800 cps 28 volts 1% IMU	vdc	4.2		4.8		
40	800 cps 28 volts 1% optics	vac	▨		▨	▨	▨
42	800 cps 28 volts 1% optics	vdc	4.2		4.8		
43	PIPA temperature	vdc	▨		▨	▨	▨

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC
NO. 12224
REV. M

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
45	PIPA temperature	vdc	2.0		3.5		
46	IRIG temperature	vdc	▨		▨	▨	▨
48	IRIG temperature	vdc	2.37		3.75		
50	IMU heater current	vdc	▨		▨	▨	▨
52	IMU heater current	vdc	3.9		4.8		
54	IMU blower current	vdc	▨		▨	▨	▨
56	IMU blower current	vdc	4.0		4.6		
69	Maximum right	vac	▨		▨	▨	▨
	Maximum left	vac	▨		▨	▨	▨
	Maximum meter spread	vac	▨		▨	▨	▨
70	High voltage	vdc	▨		▨	▨	▨
	Low voltage	vdc	▨		▨	▨	▨
	Maximum meter spread	vdc	▨		▨	▨	▨
72	IG servo error	▨	0.7735		1.0465		
79	Maximum right	vac	▨		▨	▨	▨
	Maximum left	vac	▨		▨	▨	▨
	Maximum meter spread	vac	▨		▨	▨	▨
80	High voltage	vdc	▨		▨	▨	▨

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC
NO. 12224
REV. M

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
80 (cont)	Low voltage	vdc	▨		▨	▨	▨
	Maximum meter spread	vdc	▨		▨	▨	▨
82	MG servo error	▨	0.7735		1.0465		
89	Maximum right	vac	▨		▨	▨	▨
	Maximum left	vac	▨		▨	▨	▨
	Maximum meter spread	vac	▨		▨	▨	▨
90	High voltage	vdc	▨		▨	▨	▨
	Low voltage	vdc	▨		▨	▨	▨
	Maximum meter spread	vdc	▨		▨	▨	▨
92	OG servo error	▨	0.7735		1.0465		
108	IG torque motor current (channel 6)	Δv	▨		▨	▨	▨
	IG torque motor current (channel 8)	Δv	channel 6 x 4		channel 6 x 6		
114	MG torque motor current (channel 6)	Δv	▨		▨	▨	▨
	MG torque motor current (channel 8)	Δv	channel 6 x 4		channel 6 x 6		
120	OG torque motor current (channel 6)	Δv	▨		▨	▨	▨

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC
NO. 12224
REV. M

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
120 (cont)	OG torque motor current (channel 8)	Δv	channel 6 x 1.8		channel 6 x 3.8		
123	IG 1X resolver cos	vac	▨		▨	▨	▨
124	IG 1X resolver cos	vdc	▨		▨	▨	▨
125	IG 1X resolver cos	▨	0.90		1.10		
126	MG 1X resolver cos	vdc	▨		▨	▨	▨
127	MG 1X resolver cos	vac	▨		▨	▨	▨
128	MG 1X resolver cos	▨	0.90		1.10		
129	OG 1X resolver cos	vac	▨		▨	▨	▨
130	OG 1X resolver cos	vdc	▨		▨	▨	▨
131	OG 1X resolver cos	▨	0.90		1.10		
132	IG 1X resolver sin	vdc	▨		▨	▨	▨
133	IG 1X resolver sin	vac	▨		▨	▨	▨
134	IG 1X resolver sin	▨	0.90		1.10		
135	MG 1X resolver sin	vac	▨		▨	▨	▨
136	MG 1X resolver sin	vdc	▨		▨	▨	▨
137	MG 1X resolver sin	▨	0.90		1.10		

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 **OF** 9

JDC NO. 12224
REV. M

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
138	OG 1X resolver sin	vdc	▨		▨	▨	▨
139	OG 1X resolver sin	vac	▨		▨	▨	▨
140	OG 1X resolver sin	▨	0.90		1.10		
150	Shaft CDU fine error	vdc	4.35		4.81		
157	Trunnion CDU fine error	vdc	4.35		4.81		
159	Trunnion CDU DAC output	vdc	4.00		5.00		
160	Shaft CDU DAC output	vdc	4.00		5.00		
162	Trunnion CDU DAC output	vdc	0.00		1.00		
163	Shaft CDU DAC output	vdc	0.00		1.00		
170	SCA input (channel 1)	Δv	▨		▨	▨	▨
	SCA output (channel 8)	Δv	channel 1 x 4.0		channel 1 x 6.0		
177	SCA input (channel 1)	Δv	▨		▨	▨	▨
	SCA output (channel 8)	Δv	channel 1 x 0.4		channel 1 x 0.6		

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 9

JDC NO. 12224
REV. M

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
184	SCA input (channel 2)	Δv	▨		▨	▨	▨
	SCA output (channel 8)	Δv	channel 2 x 4.0		channel 2 x 6.0		
192	SCA input (channel 5)	Δv	▨		▨	▨	▨
	SCA output (channel 8)	Δv	channel 5 x 0.4		channel 5 x 0.6		
196	Yaw attitude error	vac	▨		▨	▨	▨
197	Yaw attitude error	vdc	▨		▨	▨	▨
198	Yaw attitude error	▨	0.90		1.10		
199	Pitch attitude error	vac	▨		▨	▨	▨
200	Pitch attitude error	vdc	▨		▨	▨	▨
201	Pitch attitude error	▨	0.90		1.10		
202	Roll attitude error	vac	▨		▨	▨	▨
203	Roll attitude error	vdc	▨		▨	▨	▨
204	Roll attitude error	▨	0.90		1.10		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 9

JDC NO. 12224
REV. M

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
72	IG servo error = $\frac{\text{Step 70, max meter spread}}{\text{Step 69, max meter spread}}$ = 0.91 (±15%)
82	MG servo error = $\frac{\text{Step 80, max meter spread}}{\text{Step 79, max meter spread}}$ = 0.91 (±15%)
92	OG servo error = $\frac{\text{Step 90, max meter spread}}{\text{Step 89, max meter spread}}$ = 0.91 (±15%)
125	IG 1X resolver cos = $\frac{8.1 \times (\text{Step 124} - \text{Step 33})}{\text{Step 123}}$ = 1 (±10%)
128	MG 1X resolver cos = $\frac{8.1 \times (\text{Step 126} - \text{Step 33})}{\text{Step 127}}$ = 1 (±10%)
131	OG 1X resolver cos = $\frac{8.1 \times (\text{Step 130} - \text{Step 33})}{\text{Step 129}}$ = 1 (±10%)
134	IG 1X resolver sin = $\frac{8.1 \times (\text{Step 132} - \text{Step 33})}{\text{Step 133}}$ = 1 (±10%)

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 **OF** 9

JDC NO. 12224
REV. M

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
137	MG 1X resolver sin = $\frac{8.1 \times (\text{Step 136} - \text{Step 33})}{\text{Step 135}}$ = 1 (±10%)
140	OG 1X resolver sin = $\frac{8.1 \times (\text{Step 138} - \text{Step 33})}{\text{Step 139}}$ = 1 (±10%)
198	Yaw attitude error = $\frac{2.44 \times (\text{Step 197} - \text{Step 33})}{\text{Step 196}}$ = 1 (±10%)
201	Pitch attitude error = $\frac{2.44 \times (\text{Step 200} - \text{Step 33})}{\text{Step 199}}$ = 1 (±10%)
204	Roll attitude error = $\frac{2.44 \times (\text{Step 203} - \text{Step 33})}{\text{Step 202}}$ = 1 (±10%)

DATE 26 JAN 67

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 REV. - PAGE 1 OF 10

INITIAL TDRR 32758 D.S. PGS. 8

SUBSYSTEM BLOCK II G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES
PS 2015000
JDC 12202
JDC 12204

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

2. Connect Signal Conditioner Module (SCM) to G and N system in accordance with JDC 12202.

3. Perform JDC 12204 to advance G and N system to STANDBY mode.

4. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

5. Connect PSA Test Point Adapter (TPA) direct probes to TB5 jack 26 (high) and TB5 jack 30 (low).

6. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28 (±0.25) vdc.

7. Press OPTICS POWER ON pushbutton on Test Control panel.

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCM GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record DVM indication when CMC warning lamp on Indicator Control panel is lighted.

PIPA S/G OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output
CHANNEL 5 to 1	Y PIPA S/G output
CHANNEL 6 to 1	X PIPA S/G output
CHANNEL 8 to 4	SCM GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Zero Oscillograph channels 4, 5, and 6 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

9. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted.

10. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

11. Obtain Oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After at least 30 seconds in ISS standby mode, press PROCEED/ISS OPERATE pushbutton on Test Control panel.

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b. Press IMU CAGE/COMMAND pushbutton.

c. Wait at least 10 seconds for PIPA loop closure, then press PROCEED/ISS STANDBY pushbutton.

Table I

Test Selector Panel Position	Signal
105	Z PIPA S/G quadrature output
107	Y PIPA S/G quadrature output
108	X PIPA S/G quadrature output
117	Z PIPA S/G in-phase output
118	Y PIPA S/G in-phase output
119	X PIPA S/G in-phase output

12. Stop Oscillograph. Check Oscillograph record for 6 indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5, and 6. Record that traces have centered after loop closure.

POWER SUPPLY AND TEMPERATURE

13. Press PROCEED/ISS OPERATE pushbutton on Test Control panel and wait 90 seconds, then repeat step A.6.

14. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
104	2.5 vdc TM bias
103	120 vdc PIPA supply level
106	3200 cps 28 volt supply
113	800 cps 28 volt 1% IMU
128	800 cps 28 volt 1% optics
150	IMU heater current
151	IMU blower current
201	PIPA temperature
202	IRIG temperature

IG, MG, AND OG SERVO ERRORS

15. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +00000 ENTR

16. Connect following signals to Oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error
CHANNEL 2 to 2	MG servo error
CHANNEL 3 to 2	OG servo error
CHANNEL 8 to 4	SCM GDB stepper switch

DATE ______

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17. Insure that CH 3 AC indicator is lighted.

18. Zero Oscillograph channels 1, 2, and 3 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

19. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

20. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X.01
FREQUENCY meter to 20

21. Set NOR/GSE CAL switch inside Auxiliary Input Panel to NOR.

22. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

23. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

24. Press TEST START pushbutton on Test Selector panel.

25. Obtain an Oscillograph trace of stabilization loop servo error data by increasing the Signal Generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds for each test listed in table II.

Table II

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

26. Stop Oscillograph. Record peak-to-peak SCM input signals monitored on channels 1, 2, and 3, and peak-to-peak SCM output signals monitored on channel 8.

IG, MG, AND OG TORQUE MOTOR CURRENTS

27. Insure that AMPLITUDE control on Signal Generator is set to 0.

28. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

29. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

30. Zero Oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

31. Set FREQUENCY meter on Signal Generator to 50 and RANGE switch to X1.

32. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

33. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.

34. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

DATE ______

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12224 REV. - PAGE 1 OF 10

INITIAL TDRR 32758 D.S. PGS 8

SUBSYSTEM BLOCK II G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES
PS 2015000
JDC 12202
JDC 12204

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

1. Perform JDC 12204 to downmode to OIA PILOT POWER mode.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and jack damage.

2. Connect Signal Conditioner Module (SCM) to G and N system in accordance with JDC 12202.

3. Perform JDC 12204 to advance G and N system to STANDBY mode.

4. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

5. Connect PSA Test Point Adapter (TPA) direct probes to TB5 jack 26 (high) and TB5 jack 30 (low).

6. Adjust G & N POWER ADJUST control on Test Control panel until Digital Voltmeter (DVM) indicates 28 (±0.25) vdc.

7. Press OPTICS POWER ON pushbutton on Test Control panel.

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCM GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc CGC operate
102	28 vdc IMU standby
203	28 vdc optics operate

CMC WARNING

3. Set Test Selector panel to 204.

4. Perform CMC warning lamp test by entering VERB 35 into DSKY and pressing ENTR pushbutton.

5. Record DVM indication when CMC warning lamp on Indicator Control panel is lighted.

PIPA S/G OUTPUT

6. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output
CHANNEL 5 to 1	Y PIPA S/G output
CHANNEL 6 to 1	X PIPA S/G output
CHANNEL 8 to 4	SCM GDB stepper switch

7. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

8. Zero Oscillograph channels 4, 5, and 6 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

9. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted.

10. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

11. Obtain Oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After at least 30 seconds in ISS standby mode, press PROCEED/ISS OPERATE pushbutton on Test Control panel.

DATE ________

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b. Press IMU CAGE/COMMAND pushbutton.

c. Wait at least 10 seconds for PIPA loop closure, then press PROCEED/ISS STANDBY pushbutton.

Table I

Test Selector Panel Position	Signal
105	Z PIPA S/G quadrature output
107	Y PIPA S/G quadrature output
108	X PIPA S/G quadrature output
117	Z PIPA S/G in-phase output
118	Y PIPA S/G in-phase output
119	X PIPA S/G in-phase output

12. Stop Oscillograph. Check Oscillograph record for 6 indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5, and 6. Record that traces have centered after loop closure.

POWER SUPPLY AND TEMPERATURE

13. Press PROCEED/ISS OPERATE pushbutton on Test Control panel and wait 90 seconds, then repeat step A.6.

14. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
104	2.5 vdc TM bias
103	120 vdc PIPA supply level
106	3200 cps 28 volt supply
113	800 cps 28 volt 1% IMU
128	800 cps 28 volt 1% optics
150	IMU heater current
151	IMU blower current
201	PIPA temperature
202	IRIG temperature

IG, MG, AND OG SERVO ERRORS

15. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe: VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe: VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe: VERB 23	NOUN 22	Flashing
g.	+00000		ENTR

16. Connect following signals to Oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error
CHANNEL 2 to 2	MG servo error
CHANNEL 3 to 2	OG servo error
CHANNEL 8 to 4	SCM GDB stepper switch

DATE ________

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17. Insure that CH 3 AC indicator is lighted.

18. Zero Oscillograph channels 1, 2, and 3 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

19. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

20. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X.01
FREQUENCY meter to 20

21. Set NOR/GSE CAL switch inside Auxiliary Input Panel to NOR.

22. Perform following DSKY operations:

a.	VERB 42	ENTR
b.	VERB 33	ENTR

23. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

24. Press TEST START pushbutton on Test Selector panel.

25. Obtain an Oscillograph trace of stabilization loop servo error data by increasing the Signal Generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds for each test listed in table II.

Table II

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

26. Stop Oscillograph. Record peak-to-peak SCM input signals monitored on channels 1, 2, and 3, and peak-to-peak SCM output signals monitored on channel 8.

IG, MG, AND OG TORQUE MOTOR CURRENTS

27. Insure that AMPLITUDE control on Signal Generator is set to 0.

28. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

29. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

30. Zero Oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

31. Set FREQUENCY meter on Signal Generator to 50 and RANGE switch to X1.

32. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

33. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.

34. Obtain Oscillograph trace of torque motor currents by increasing Signal Generator AMPLITUDE control until Oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

DATE ________

Table III

Test	Signal Generator Output	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curren
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

35. Stop Oscillograph. Record peak-to-peak SCM input signal monitored on channel 6 and peak-to-peak SCM output signal monitored on channel 8.

1X RESOLVER SIN AND COS

36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +04500 ENTR

37. Wait 20 seconds after performing step 36, then perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Due to IMU drift steps 38.a and 38.b must be performed as rapidly as possible for each test listed in table IV.

38. Connect SCM output and SCM input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set Test Selector panel to position listed and record DVM indication.
b. Immediately set CROSSBAR CONTROL switches on Primary Signal Selector panel to position listed and record DVM indication.
c. Set CROSSBAR CONTROL switches to 271.

39. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +00000 ENTR

Table IV

Test	Test Selector Panel Position	CROSSBAR CONTROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

SHAFT AND TRUNNION CDU FINE ERROR

40. Set OPTICS switches on Indicator Control panel as follows:

MODE to CGC
COUPLING to DIRECT
TELESCOPE TRUNNION to SLAVE TO SXT
SPEED to LOW
TRACKER to OFF

41. Enter VERB 40 NOUN 55 into DSKY and press ENTR pushbutton.

42. Connect SCM shaft CDU fine error output to DVM by setting Test Selector panel to 146.

43. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

44. Connect SCM shaft CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low).

45. Set OPTICS MODE switch on Indicator Control panel to MAN.

46. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

47. Using Optics Hand Controller on Indicator Control panel, drive optics shaft axis until PAVM indicates 1.00 vac. Record DVM indication.

48. Set OPTICS MODE switch to CGC.

49. Enter VERB 40 NOUN 55 into DSKY and press ENTR pushbutton.

50. Connect SCM trunnion CDU fine error output to DVM by setting Test Selector panel to 147.

51. Connect SCM trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

52. Repeat steps 45 and 46.

53. Using Optics Hand Controller, drive optics trunnion axis until PAVM indicates 1.00 vac. Record DVM indication.

54. Set OPTICS MODE switch to CGC.

55. Enter VERB 40 NOUN 55 into DSKY and press ENTR pushbutton.

SHAFT AND TRUNNION CDU DAC OUTPUTS

56. Set OPTICS MODE switch on Indicator Control panel to MAN.

57. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00035 ENTR
c. 00000 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00036 ENTR
f. 00000 ENTR
g. VERB 21 NOUN 10 ENTR
h. 00012 ENTR
i. 00012 ENTR
j. VERB 21 NOUN 01 ENTR
k. 00035 ENTR
l. 04111 ENTR
m. VERB 21 NOUN 01 ENTR
n. 00036 ENTR
o. 01644 ENTR

58. Connect SCM trunnion CDU DAC output to DVM by setting Test Selector panel to 126. Record DVM indication.

59. Connect SCM shaft CDU DAC output to DVM by setting Test Selector panel to 127. Record DVM indication.

60. Set OPTICS MODE switch on Indicator Control panel to CGC. Wait 10 seconds, then set OPTICS MODE switch to ZERO.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

61. Set Test Selector panel to 129.

62. Connect SCM SXT shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCM GDB stepper switch

63. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

64. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

65. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS MODE switch to MAN.

66. Hold Optics Hand Controller to left limit not longer than 20 seconds.

67. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCM SXT shaft tach input and output signals monitored on channels 1 and 8.

68. Set Test Selector panel to 148 to connect SCM SCT shaft tach output to Oscillograph.

69. Connect SCM SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

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70. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

71. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

72. Set OPTICS SPEED switch on Indicator Control panel to HI.

73. Hold Optics Hand Controller to right limit for approximately 20 seconds.

74. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCM SCT shaft tach input and output signals monitored on channels 1 and 8.

75. Set Test Selector panel to 130 to connect SCM SXT trunnion tach output to Oscillograph.

76. Connect SCM SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

77. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

78. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

79. Set OPTICS SPEED switch on Indicator Control panel to MED.

80. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

81. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCM SXT trunnion tach input and output signals monitored on channels 2 and 8.

82. Set Test Selector panel to 149 to connect SCM SCT trunnion tach output to Oscillograph.

83. Connect SCM SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

84. Insure that CH 5 AC indicator is lighted.

85. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

86. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

87. Set OPTICS SPEED switch on Indicator Control panel to HI.

88. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

89. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCM SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

90. Perform following DSKY operations:

a. VERB 42 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +00000 ENTR

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curren
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

35. Stop Oscillograph. Record peak-to-peak SCM input signal monitored on channel 6 and peak-to-peak SCM output signal monitored on channel 8.

1X RESOLVER SIN AND COS

36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR

37. Wait 20 seconds after performing step 36, then perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Due to IMU drift steps 38.a and 38.b must be performed as rapidly as possible for each test listed in table IV.

38. Connect SCM output and SCM input to DVM for each test listed in table IV. For each test, perform following operations:

a. Set Test Selector panel to position listed and record DVM indication.

b. Immediately set CROSSBAR CONTROL switches on Primary Signal Selector panel to position listed and record DVM indication.

c. Set CROSSBAR CONTROL switches to 271.

39. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

Table IV

Test	Test Selector Panel Position	CROSSBAR CONTROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

SHAFT AND TRUNNION CDU FINE ERROR

40. Set OPTICS switches on Indicator Control panel as follows:

MODE to CGC
COUPLING to DIRECT
TELESCOPE TRUNNION to SLAVE TO SXT
SPEED to LOW
TRACKER to OFF

41. Enter VERB 40 NOUN 55 into DSKY and press ENTR pushbutton.

42. Connect SCM shaft CDU fine error output to DVM by setting Test Selector panel to 146.

43. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

44. Connect SCM shaft CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 23 (high) and TB3 jack 34 (low).

45. Set OPTICS MODE switch on Indicator Control panel to MAN.

46. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00011 ENTR

47. Using Optics Hand Controller on Indicator Control panel, drive optics shaft axis until PAVM indicates 1.00 vac. Record DVM indication.

48. Set OPTICS MODE switch to CGC.

49. Enter VERB 40 NOUN 55 into DSKY and press ENTR pushbutton.

50. Connect SCM trunnion CDU fine error output to DVM by setting Test Selector panel to 147.

51. Connect SCM trunnion CDU fine error input to PAVM by connecting PSA TPA buffered probes to TB3 jack 22 (high) and TB3 jack 34 (low).

52. Repeat steps 45 and 46.

53. Using Optics Hand Controller, drive optics trunnion axis until PAVM indicates 1.00 vac. Record DVM indication.

54. Set OPTICS MODE switch to CGC.

55. Enter VERB 40 NOUN 55 into DSKY and press ENTR pushbutton.

SHAFT AND TRUNNION CDU DAC OUTPUTS

56. Set OPTICS MODE switch on Indicator Control panel to MAN.

57. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00035 ENTR
c. 00000 ENTR
d. VERB 21 NOUN 01 ENTR
e. 00036 ENTR
f. 00000 ENTR
g. VERB 21 NOUN 10 ENTR
h. 00012 ENTR
i. 00012 ENTR
j. VERB 21 NOUN 01 ENTR
k. 00035 ENTR
l. 04111 ENTR
m. VERB 21 NOUN 01 ENTR
n. 00036 ENTR
o. 01644 ENTR

58. Connect SCM trunnion CDU DAC output to DVM by setting Test Selector panel to 126. Record DVM indication.

59. Connect SCM shaft CDU DAC output to DVM by setting Test Selector panel to 127. Record DVM indication.

60. Set OPTICS MODE switch on Indicator Control panel to CGC. Wait 10 seconds, then set OPTICS MODE switch to ZERO.

SXT AND SCT SHAFT AND TRUNNION TACH OUTPUTS

61. Set Test Selector panel to 129.

62. Connect SCM SXT shaft tach input and output signals to Oscillograph by setting switches on Oscillograph Signal Selector panel as follows:

Switch	Signal
CHANNEL 1 to 12	SXT shaft tach monitor
CHANNEL 8 to 4	SCM GDB stepper switch

63. Zero Oscillograph channel 1 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

64. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

65. Set OPTICS SPEED switch on Indicator Control panel to MED. Set OPTICS MODE switch to MAN.

66. Hold Optics Hand Controller to left limit not longer than 20 seconds.

67. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCM SXT shaft tach input and output signals monitored on channels 1 and 8.

68. Set Test Selector panel to 148 to connect SCM SCT shaft tach output to Oscillograph.

69. Connect SCM SCT shaft tach input to Oscillograph by setting CHANNEL 1 switch on Oscillograph Signal Selector panel to 13.

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70. Zero Oscillograph channel 1 and set gain at 200 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

71. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

72. Set OPTICS SPEED switch on Indicator Control panel to HI.

73. Hold Optics Hand Controller to right limit for approximately 20 seconds.

74. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCM SCT shaft tach input and output signals monitored on channels 1 and 8.

75. Set Test Selector panel to 130 to connect SCM SXT trunnion tach output to Oscillograph.

76. Connect SCM SXT trunnion tach input to Oscillograph by setting CHANNEL 2 switch on Oscillograph Signal Selector panel to 12.

77. Zero Oscillograph channel 2 and set gain at 20 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

78. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

79. Set OPTICS SPEED switch on Indicator Control panel to MED.

80. Hold Optics Hand Controller to upper limit not longer than 10 seconds.

81. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCM SXT trunnion tach input and output signals monitored on channels 2 and 8.

82. Set Test Selector panel to 149 to connect SCM SCT trunnion tach output to Oscillograph.

83. Connect SCM SCT trunnion tach input to Oscillograph by setting CHANNEL 5 switch on Oscillograph Signal Selector panel to 11.

84. Insure that CH 5 AC indicator is lighted.

85. Zero Oscillograph channel 5 and set gain at 50 mv/mm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

86. Set CHART DRIVE switch on Oscillograph Control to MM/SEC.

87. Set OPTICS SPEED switch on Indicator Control panel to HI.

88. Hold Optics Hand Controller to lower limit for approximately 10 seconds.

89. Set CHART DRIVE switch on Oscillograph Control panel to OFF. Record SCM SCT trunnion tach input and output signals monitored on channels 5 and 8.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

90. Perform following DSKY operations:

a. VERB 42 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR

BLOCK II SIGNAL CONDITIONER
JOB FUNCTIONAL CHECKOUT | JDC 12224 REV - PAGE 9 OF 10
SUBSYSTEM BLOCK II G & N SYSTEM | ASSY

d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

91. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 92. Ignore lamp indication.

92. Perform following DSKY operations:
a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flahsing
g. +01600 ENTR

93. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel.

94. Connect SCM input to PAVM and SCM output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCM input on PAVM and SCM output on DVM for each test.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

95. Perform JDC 12204 to turn off G and N system.

C. CALCULATIONS

1. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

b. MG 1X resolver cos =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

c. OG 1X resolver cos =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

DATE ________

BLOCK II SIGNAL CONDITIONER
JOB FUNCTIONAL CHECKOUT | JDC 12224 REV - PAGE 10 OF 10
SUBSYSTEM BLOCK II G & N SYSTEM | ASSY

d. IG 1X resolver sin =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

e. MG 1X resolver sin =

$$\frac{8.1\ (\text{SCM input (DVM)} - 2.5\ \text{vdc bias}}{}$$

= 1 (±10%)

f. OG 1X resolver sin =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

2. Perform following attitude error calculations:

a. Roll attitude error =

$$\frac{2.44\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (PAVM)}}$$

= 1 (±10%)

b. Yaw attitude error =

$$\frac{2.44\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (PAVM)}}$$

=1 (±10%)

c. Pitch attitude error =

$$\frac{2.44\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (PAVM)}}$$

= 1 (±10%)

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8

JDC
NO. 12224
REV. -
INITIAL TDRR 32753

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ______ DWG ______ REV. ____

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ______ CAL DATE
NAME ________ SER. NO. ______ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate	vdc	4.0		4.6		
	28 vdc IMU standby	vdc	4.0		4.6		
	28 vdc optics operate	vdc	4.0		4.6		
B.5	CMC warning	vdc	4.0		4.6		
B.12	Loop closure test 1	▨	▨		▨		
	Loop closure test 2	▨	▨		▨		
	Loop closure test 3	▨	▨		▨		
	Loop closure test 4	▨	▨		▨		
	Loop closure test 5	▨	▨		▨		
	Loop closure test 6	▨	▨		▨		
B.14	2.5 vdc TM bias	vdc	2.47		2.53		
	120 vdc PIPA supply level	vdc	2.80		4.20		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.14 (cont)	3200 cps 28 volt supply	vdc	4.20		4.80		
	800 cps 28 volt 1% IMU	vdc	4.20		4.80		
	800 cps 28 volt 1% optics	vdc	4.20		4.80		
	IMU heater current	vdc	4.0		4.6		
	IMU blower current	vdc	4.0		4.6		
	PIPA temperature	vdc	2.0		3.0		
	IRIG temperature	vdc	2.37		2.70		
B.26.a	IG servo error channel 1	v p-p	▨		▨		
	IG servo error channel 8	v p-p	channel 1x6/5 -15%		channel 1x6/5 +15%		
B.26.b	MG servo error channel 2	v p-p	▨		▨		
	MG servo error channel 8	v p-p	channel 2x6/5 -15%		channel 2x6/5 +15%		
B.26.c	OG servo error channel 3	v p-p	▨		▨		
	OG servo error channel 8	v p-p	channel 3x6/5 -15%		channel 3x6/5 +15%		

DATE ________

BLOCK II SIGNAL CONDITIONER
JOB FUNCTIONAL CHECKOUT
JDC 12224 REV - PAGE 9 OF 10

SUBSYSTEM BLOCK II G & N SYSTEM
ASSY

d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
91. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 92. Ignore lamp indication.

92. Perform following DSKY operations:
a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flahsing
g. +01600 ENTR

93. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel.

94. Connect SCM input to PAVM and SCM output to DVM by connecting PSA TPA direct probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCM input on PAVM and SCM output on DVM for each test.

Table V

Test	PSA TPA Test Points		Test Selector Panel Posit'on	Signal
	High	Low		
a	TB4-43	TB4-47	116	Roll attitude error
b	TB4-44	TB4-48	114	Yaw attitude error
c	TB4-45	TB4-49	115	Pitch attitude error

95. Perform JDC 12204 to turn off G and N system.

C. CALCULATIONS

1. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos =

$$\frac{8.1\text{ (SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (DVM)}}$$

= 1 (±10%)

b. MG 1X resolver cos =

$$\frac{8.1\text{ (SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (DVM)}}$$

= 1 (±10%)

c. OG 1X resolver cos =

$$\frac{8.1\text{ (SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (DVM)}}$$

= 1 (±10%)

DATE ________

FORM 00144
Chg. 7-23-65

BLOCK II SIGNAL CONDITIONER
JOB FUNCTIONAL CHECKOUT
JDC 12224 REV - PAGE 10 OF 10

SUBSYSTEM BLOCK II G & N SYSTEM
ASSY

d. IG 1X resolver sin =

$$\frac{8.1\text{ (SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (DVM)}}$$

= 1 (±10%)

e. MG 1X resolver sin =

$$\frac{8.1\text{ (SCM input (DVM) - 2.5 vdc bias}}{}$$

= 1 (±10%)

f. OG 1X resolver sin =

$$\frac{8.1\text{ (SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (DVM)}}$$

= 1 (±10%)

2. Perform following attitude error calculations:

a. Roll attitude error =

$$\frac{2.44\text{ (SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (PAVM)}}$$

= 1 (±10%)

b. Yaw attitude error =

$$\frac{2.44\text{ (SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (PAVM)}}$$

=1 (±10%)

c. Pitch attitude error =

$$\frac{2.44\text{ (SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (PAVM)}}$$

= 1 (±10%)

DATE ________

FORM 00144
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8

JDC
NO. 12224
REV. -
INITIAL TDRR 32758

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ________ DWG ________ REV. ________

TEST HISTORY
DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ________ CAL DATE
NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc CGC operate	vdc	4.0		4.6		
	28 vdc IMU standby	vdc	4.0		4.6		
	28 vdc optics operate	vdc	4.0		4.6		
B.5	CMC warning	vdc	4.0		4.6		
B.12	Loop closure test 1	▨	▨		▨		
	Loop closure test 2	▨	▨		▨		
	Loop closure test 3	▨	▨		▨		
	Loop closure test 4	▨	▨		▨		
	Loop closure test 5	▨	▨		▨		
	Loop closure test 6	▨	▨		▨		
B.14	2.5 vdc TM bias	vdc	2.47		2.53		
	120 vdc PIPA supply level	vdc	2.80		4.20		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.14 (cont)	3200 cps 28 volt supply	vdc	4.20		4.80		
	800 cps 28 volt 1% IMU	vdc	4.20		4.80		
	800 cps 28 volt 1% optics	vdc	4.20		4.80		
	IMU heater current	vdc	4.0		4.6		
	IMU blower current	vdc	4.0		4.6		
	PIPA temperature	vdc	2.0		3.0		
	IRIG temperature	vdc	2.37		2.70		
B.26.a	IG servo error channel 1	v p-p	▨		▨		
	IG servo error channel 8	v p-p	channel 1x6/5 -15%		channel 1x6/5 +15%		
B.26.b	MG servo error channel 2	v p-p	▨		▨		
	MG servo error channel 8	v p-p	channel 2x6/5 -15%		channel 2x6/5 +15%		
B.26.c	OG servo error channel 3	v p-p	▨		▨		
	OG servo error channel 8	v p-p	channel 3x6/5 -15%		channel 3x6/5 +15%		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.35.a	IG torque motor current channel 6	mm p-p	▨		▨		
	IG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.35.b	MG torque motor current channel 6	mm p-p	▨		▨		
	MG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.35.c	OG torque motor current channel 6	mm p-p	▨		▨		
	OG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.38.a	IG 1X resolver cos (Test a)	vdc	▨		▨		
B.38.b	IG 1X resolver cos (Test a)	vac	▨		▨		
B.38.a	MG 1X resolver cos (Test b)	vdc	▨		▨		
B.38.b	MG 1X resolver cos (Test b)	vac	▨		▨		
B.38.a	OG 1X resolver cos (Test c)	vdc	▨		▨		
B.38.b	OG 1X resolver cos (Test c)	vac	▨		▨		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.38.a	IG 1X resolver sin (Test d)	vdc	▨		▨		
B.38.b	IG 1X resolver sin (Test d)	vac	▨		▨		
B.38.a	MG 1X resolver sin (Test e)	vdc	▨		▨		
B.38.b	MG 1X resolver sin (Test e)	vac	▨		▨		
B.38.a	OG 1X resolver sin (Test f)	vdc	▨		▨		
B.38.b	OG 1X resolver sin (Test f)	vac	▨		▨		
B.47	Shaft CDU fine error	vdc	4.35		4.81		
B.53	Trunnion CDU fine error	vdc	4.35		4.81		
B.58	Trunnion CDU DAC output	vdc	4.00		5.00		
B.59	Shaft CDU DAC output	vdc	4.00		5.00		
B.67	SCM input channel 1	v p-p	▨		▨		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.67 (cont)	SCM output channel 8	v p-p	channel 1 x 5 - 15%		channel 1 x 5 + 15%		
B.74	SCM input channel 1	v p-p	▨		▨		
	SCM output channel 8	v p-p	channel 1 x 1/2 - 15%		channel 1 x 1/2 + 15%		
B.81	SCM input channel 2	v p-p	▨		▨		
	SCM output channel 8	v p-p	channel 2 x 5 - 15%		channel 2 x 5 + 15%		
B.89	SCM input channel 5	v p-p	▨		▨		
	SCM output channel 8	v p-p	channel 5 x 1/2 - 15%		channel 5 x 1/2 + 15%		
B.94.a	Roll attitude error (PAVM)	vac	▨		▨		
	Roll attitude error (DVM)	vdc	▨		▨		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.94.b	Yaw attitude error (PAVM)	vac	▨		▨		
	Yaw attitude error (DVM)	vdc	▨		▨		
B.94.c	Pitch attitude error (PAVM)	vac	▨		▨		
	Pitch attitude error (DVM)	vdc	▨		▨		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.35.a	IG torque motor current channel 6	mm p-p	▨		▨		
	IG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.35.b	MG torque motor current channel 6	mm p-p	▨		▨		
	MG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.35.c	OG torque motor current channel 6	mm p-p	▨		▨		
	OG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.38.a	IG 1X resolver cos (Test a)	vdc	▨		▨		
B.38.b	IG 1X resolver cos (Test a)	vac	▨		▨		
B.38.a	MG 1X resolver cos (Test b)	vdc	▨		▨		
B.38.b	MG 1X resolver cos (Test b)	vac	▨		▨		
B.38.a	OG 1X resolver cos (Test c)	vdc	▨		▨		
B.38.b	OG 1X resolver cos (Test c)	vac	▨		▨		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.38.a	IG 1X resolver sin (Test d)	vdc	▨		▨		
B.38.b	IG 1X resolver sin (Test d)	vac	▨		▨		
B.38.a	MG 1X resolver sin (Test e)	vdc	▨		▨		
B.38.b	MG 1X resolver sin (Test e)	vac	▨		▨		
B.38.a	OG 1X resolver sin (Test f)	vdc	▨		▨		
B.38.b	OG 1X resolver sin (Test f)	vac	▨		▨		
B.47	Shaft CDU fine error	vdc	4.35		4.81		
B.53	Trunnion CDU fine error	vdc	4.35		4.81		
B.58	Trunnion CDU DAC output	vdc	4.00		5.00		
B.59	Shaft CDU DAC output	vdc	4.00		5.00		
B.67	SCM input channel 1	v p-p	▨		▨		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.67 (cont)	SCM output channel 8	v p-p	channel 1 x 5 - 15%		channel 1 x 5 + 15%		
B.74	SCM input channel 1	v p-p	▨		▨		
	SCM output channel 8	v p-p	channel 1 x 1/2 - 15%		channel 1 x 1/2 + 15%		
B.81	SCM input channel 2	v p-p	▨		▨		
	SCM output channel 8	v p-p	channel 2 x 5 - 15%		channel 2 x 5 + 15%		
B.89	SCM input channel 5	v p-p	▨		▨		
	SCM output channel 8	v p-p	channel 5 x 1/2 - 15%		channel 5 x 1/2 + 15%		
B.94.a	Roll attitude error (PAVM)	vac	▨		▨		
	Roll attitude error (DVM)	vdc	▨		▨		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.94.b	Yaw attitude error (PAVM)	vac	▨		▨		
	Yaw attitude error (DVM)	vdc	▨		▨		
B.94.c	Pitch attitude error (PAVM)	vac	▨		▨		
	Pitch attitude error (DVM)	vdc	▨		▨		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS

IG 1X resolver cos $= \frac{8.1\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (DVM)}} = 1$ (±10%)

MG 1X resolver cos $= \frac{8.1\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (DVM)}} = 1$ (±10%)

OG 1X resolver cos $= \frac{8.1\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (DVM)}} = 1$ (±10%)

IG 1X resolver sin $= \frac{8.1\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (DVM)}} = 1$ (±10%)

MG 1X resolver sin $= \frac{8.1\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (DVM)}} = 1$ (±10%)

OG 1X resolver sin $= \frac{8.1\ (\text{SCM output (DVM)}-2.5\ \text{vdc bias})}{\text{SCM input (DVM)}} = 1$ (±10%)

Roll attitude error $= \frac{2.44\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (PAVM)}} = 1$ (±10%)

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS

Yaw attitude error $= \frac{2.44\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (PAVM)}} = 1$ (±10%

Pitch attitude error $= \frac{2.44\ (\text{SCM output (DVM)} - 2.5\ \text{vdc bias})}{\text{SCM input (PAVM)}} = 1$ (±10%)

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 **OF** 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS

IG 1X resolver cos $= \dfrac{8.1\ \text{(SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$

MG 1X resolver cos $= \dfrac{8.1\ \text{(SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$

OG 1X resolver cos $= \dfrac{8.1\ \text{(SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$

IG 1X resolver sin $= \dfrac{8.1\ \text{(SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$

MG 1X resolver sin $= \dfrac{8.1\ \text{(SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$

OG 1X resolver sin $= \dfrac{8.1\ \text{(SCM output (DVM)-2.5 vdc bias)}}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$

Roll attitude error $= \dfrac{2.44\ \text{(SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 **OF** 8

JDC
NO. 12224
REV. -

JOB BLOCK II SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS

Yaw attitude error $= \dfrac{2.44\ \text{(SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%$

Pitch attitude error $= \dfrac{2.44\ \text{(SCM output (DVM) - 2.5 vdc bias)}}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$

DATE ________

JOB RETEST PROCEDURES FOR CDU

JDC 12285 **REV.** - **PAGE** 1 **OF** 7
INITIAL TDRR 36995 **D.S. PGS** 5

SUBSYSTEM G AND N SYSTEM
ASSY.

DESCRIPTION This JDC provides the retests required to demonstrate the integrity of a replacement CDU in a G & N System configuration.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ND 1021043

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Avoid slewing SXT shaft and trunnion axes into their mechanical stops.

2. Insure that cable W226-P1 is removed and connector assembly (2003099) is connected to CGC test connector before proceeding with this JDC.

NOTE: If VERB display on DSKY contains a number from 11 through 17, KEY REL may flash when DSKY entries are made.

A. PREPARATION

DOWNMODE

1. Downmode system to OIA ON in accordance with JDC 12204.

CDU REMOVAL

2. Disconnect and remove CDU that is to be replaced in accordance with JDC 17104.

INSPECTION

3. Inspect replacement CDU as follows and record observed indications:

a. Inspection status indicators such as tags and stamps to insure all respective subassembly requirements have been met.

b. Harnesses for nicks, scratches, wire abrasions, loose lacing, dents, incapsulant defects, and pin condition.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE __________

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c. Mating surfaces for cracks and foreign material.

d. Markings for legibility, appearance and proper registration.

e. Surfaces for scratches, dents, nicks, or other obvious defects.

f. All potting material for condition.

g. All plugs and jacks for pin condition.

INSTALLATION

4. Install replacement CDU in accordance with JDC 17104.

TURNON

5. Perform following JDC's in the order listed:

a. JDC 12202

b. JDC 12203

6. Perform JDC 12215 to establish a Master Initialization condition, then place system in ISS STANDBY mode in accordance with JDC 12204.

7. Insure STBY indicator on DSKY is not lighted. If lighted, press and hold PRO (or STBY) pushbutton until indicator goes out. If STBY indicator does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed. Press ALARM RESET pushbutton on CTS Programmer and Monitor panel.

8. Set CROSSBAR CONTROL on Primary Signal Selector panel to 171. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28.0 (±0.25) vdc. Record.

NOTE: Standby Requirements. Allow 2 hours to elapse before proceeding with following exceptions:

a. If G & N System has been in power off state for less than five days with gimbals in parked position (IG and OG at 0° and MG at 90° with G & N Mounting Fixture cradle at 32.5°) and system has not been moved, wait 90 seconds before proceeding.

b. If G & N System has been in power off state for less than 15 minutes with gimbals in unparked position, wait 90 seconds before proceeding.

c. If G & N System has been in power off state with gimbals in unparked position for more than 15 minutes but less than 2 hours, allow warmup time equal to the time off before proceeding.

B. PROCEDURE

9. Set CROSSBAR CONTROL on Primary Signal Selector panel to 175. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±0.25) vdc. Record indication.

DATE __________

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10. Insure PROCEED portion of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted. Press PROCEED/ISS OPERATE pushbutton. ISS OPERATE shall light.

NOTE: Wait until WHEEL RUN UP lamp on Monitor panel goes out before proceeding.

11. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
c. Wait 5 seconds before proceeding
d. VERB 36 ENTR
e. VERB 41 NOUN 20 ENTR
f. Observe
VERB 21 NOUN 22 Flashing
g. +09000 ENTR
h. Observe
VERB 22 NOUN 22 Flashing
i. +09000 ENTR
j. Observe
VERB 23 NOUN 22 Flashing
k. +09000 ENTR
l. Observe
NO ATT lamp lights
GIMBAL LOCK lamps on DSKY and Monitor panel light.

12. Perform following DSKY operations:

a. VERB 06 NOUN 20 ENTR
b. Observe
Row 1 indicates approximately +09000
Row 2 indicates approximately +09000
Row 3 indicates approximately +09000

NOTE: PROG alarm on DSKY may light during performance of step 13. Ignore alarm.

13. Press PROCEED/ISS STANDBY pushbutton. ISS OPERATE shall go out and ISS STANDBY shall remain lighted.

TURN-ON CAGE TEST

14. Perform following DSKY operations:

a. VERB 34 ENTR
b. VERB 11 NOUN 10 ENTR
c. 00012 ENTR

15. Insure that PROCEED portion of PROCEED/ISS OPERATE pushbutton is lighted. Press PROCEED/ISS OPERATE pushbutton. PROCEED shall go out and ISS OPERATE shall light. NO ATT lamp on DSKY shall light.

16. Observe PIPA Monitor Scope and verify and record that PIPA torquing is not present until after DSKY display changes from 00030 to 40000 to 00000. NO ATT lamp shall go out.

17. Perform following DSKY operations:

a. VERB 16 NOUN 20 ENTR

18. Record OG, MG and IG positions indicated on Gimbal Position Control panel and on DSKY displays. All axes shall indicate approximately 000.00°.

POWER SUPPLIES TEST

19. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON shall light.

DATE __________

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20. Set CROSSBAR CONTROL on Primary Signal Selector panel to positions listed below and measure and record corresponding signals on DVM. Use Oscilloscope to measure peak-to-peak noise on signal listed in step f. Record.

Step	Signal	CROSSBAR CONTROL
a.	28 vdc operate/IMU	269
b.	28 vdc operate/IMU	220
c.	28 vdc optics	200
d.	IMU 28 v 800 cps 1%	121
e.	Optics 28 v 800 cps 1%	101
f.	CDU +4 vdc	118

21. Set Counter switches and controls as follows:

a. DISPLAY TIME (N_2) to 10^5
b. DISPLAY RESET to ZERO
c. CLOCK FREQUENCY DIVIDER to 10
d. CLOCK SELECTOR to INT
e. INPUT SELECTOR to C SENSE
f. SENSE SELECTOR to FWD
g. TRIGGER VOLTAGE ATTEN D to 10 AC
h. TRIGGER VOLTAGE fully counterclockwise
i. SAMPLE TIME (N_1) to 008000
j. FUNCTION to RATIO OR PERIOD

22. Insure D SIGNAL pushbutton on Primary Signal Selector panel is lighted. Set COUNTER INPUT "D" SIGNAL selector to 1.

23. Adjust TRIGGER VOLTAGE ATTEN D selector switch on Counter to highest attenuation level that causes triggering. Set corresponding TRIGGER VOLTAGE control to insure Counter starts and stops in approximately 10 seconds.

24. Set switches to positions listed below and measure corresponding signal frequencies on Counter. Record.

Step	Signal	COUNTER INPUT "D" SIGNAL Selector	Counter SAMPLE TIME (N_1)
a.	IMU 28 volts 800 cps 1%	1	008000
b.	Optics 28 volts 800 cps 1%	2	008000

OPTICS CDU TEST

25. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 20 ENTR
c. VERB 41 NOUN 20 ENTR
d. +00000 ENTR
e. +00000 ENTR
f. +00000 ENTR
g. Observe
VERB 41 NOUN 22 Displayed
NO ATT Lights

NOTE: Step 26 applies to Indicator Control panel 2021290 only.

26. Set switches on Indicator Control panel to positions listed below:

a. OPTICS COUPLING to DIRECT

DATE __________

JOB RETEST PROCEDURES FOR CDU | JDC 12285, REV - PAGE 5 OF 7

SUBSYSTEM G AND N SYSTEM | ASSY

b. OPTICS MODE to MAN
c. OPTICS TEL TRUN to SLAVE TO SXT
d. OPTICS ZERO to OFF
e. OPTICS SPEED to LO
f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

NOTE: Step 27 applies to all Indicator Control panels except 2021290.

27. Set switches on Indicator Control panel to positions listed below:

a. OPTICS CONTROLLER COUPLING to DIRECT
b. OPTICS MODE to MAN
c. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT
d. OPTICS TRACKER to OFF
e. OPTICS CONTROLLER SPEED to LO
f. CONDITION LAMPS to ON
g. UP TELEMETRY to ACCEPT

NOTE: Step 28 applies to Indicator Control panel 2021290 only.

28. Set OPTICS ZERO switch to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to CMC.

NOTE: Step 29 applies to all Indicator Control panels except 2021290.

29. Set OPTICS MODE switch to ZERO. After 20 seconds, set OPTICS MODE switch to CGC.

30. Perform following DSKY operations:

a. VERB 16 NOUN 55 ENTR

31. Set OPTICS MODE switch to MAN.

32. Position Optics Hand Controller as listed below, and slew SXT trunnion (DSKY Row 2) to each position listed and record corresponding trunnion TPAC indication. Use desired slew speed.

Step	SXT Trunnion DSKY Row 2 Positions	Optics Hand Controller Position
a.	00.000 (±0.010)	Up or Down
b.	22.500 (±0.010)	Up
c.	45.000 (±0.010)	Up
d.	67.500 (±0.010)	Up
e.	90.000 (±0.010)	Up

33. Position Optics Hand Controller down and slew SXT trunnion until DSKY Row 2 indicates zero.

34. Position Optics Hand Controller as listed below, and slew SXT shaft (DSKY Row 1) to each position listed and record corresponding shaft TPAC indication. Use desired slew speed.

Step	SXT Shaft DSKY Row 1 Position	Optics Hand Controller Position
a.	000.00 (±.010)	left or right
b.	045.00 (±.010)	right
c.	090.00 (±.010)	right
d.	135.00 (±.010)	right
e.	180.00 (±.010)	right
f.	225.00 (±.010)	right
g.	270.00 (±.010)	right

DATE ________

JOB RETEST PROCEDURES FOR CDU | JDC 12285 REV - PAGE 6 OF 7

SUBSYSTEM G AND N SYSTEM | ASSY

NOTE: Step 35 applies to Indicator Control panel 2021290 only.

35. Set OPTICS ZERO switch to ZERO. Wait one minute before proceeding. Set OPTICS ZERO switch to OFF and OPTICS MODE switch to CMC and perform following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

NOTE: Wait until optics stop driving before proceeding.

NOTE: Step 36 applies to all Indicator Control panels except 2021290.

36. Set OPTICS MODE switch to ZERO. Wait one minute before proceeding. Set OPTICS MODE switch to CGC and perform following DSKY operations:

a. VERB 41 NOUN 55 ENTR
b. +27000 ENTR
c. +45000 ENTR

NOTE: Wait until optics stop driving before proceeding.

37. Perform following DSKY operations:

a. VERB 06 NOUN 55 ENTR
b. Record Row 1 and Row 2 indications

38. Record shaft and trunnion TPAC indications.

39. Using Optics Hand Controller, position the SXT Trunnion between 0° and 10° as indicated by the Trunnion TPAC.

NOTE: Step 40 applies to Indicator Control panel 2021290 only.

40. Set OPTICS ZERO switch to ZERO. After 20 seconds, set OPTICS ZERO switch to OFF. Set OPTICS MODE switch to MAN.

NOTE: Step 41 applies to all Indicator Control panels except 2021290.

41. Set OPTICS MODE switch to ZERO. After 20 seconds, set OPTICS MODE switch to MAN.

CDU TRUN FINE ERROR

42. Set CROSSBAR CONTROL to 206 to monitor CDU trunnion fine error on PAVM.

43. Set DEGREES dial on PAVM to 50.

NOTE: Step 44 applies to Indicator Control panel 2021290 only.

44. Set OPTICS SPEED switch to LO.

NOTE: Step 45 applies to all Indicator Control panels except 2021290.

45. Set OPTICS CONTROLLER SPEED switch to LO.

46. Hold Optics Hand Controller at upper limit and measure voltage indicated on PAVM while Optics is slewing. Record PAVM indication and release Optics Hand Controller.

DATE ________

JOB RETEST PROCEDURES FOR CDU | JDC 12285 REV - PAGE 7 OF 7

SUBSYSTEM G AND N SYSTEM | ASSY

CDU SHAFT FINE ERROR

47. Set CROSSBAR CONTROL to 205 to monitor CDU shaft fine error on PAVM.

NOTE: Step 48 applies to Indicator Control panel 2021290 only.

48. Set OPTICS ZERO switch to ZERO. After 20 seconds set OPTICS ZERO switch to OFF.

NOTE: Step 49 applies to all Indicator Control panels except 2021290.

49. Set OPTICS MODE switch to ZERO. After 20 seconds set OPTICS MODE switch to MAN.

50. Hold Optics Hand Controller at right hand limit and measure voltage indicated on PAVM while Optics is slewing. Record PAVM indication and release Optics Hand Controller.

51. Perform following JDC's in the order listed.

a. JDC 12216
b. JDC 12221

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 8

NO. 12285 JDC
REV -
INITIAL TDRR 36995

JOB RETEST PROCEDURES FOR CDU

ASSEMBLY UNDER TEST

TITLE ________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ ________ CAL DATE
NAME ________ SER. NO. ________ ________ CAL DATE

CONDUCTED BY ________ NAME / AFFILIATION APPROVED BY ________ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	REJ	ACC
3.a	Applicable inspections		
3.b	Harnesses		
3.c	Mating surfaces		
3.d	Markings		
3.e	Surfaces		
3.f	Potting material		
3.g	Plugs and jacks		
	REMARKS:		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 5

JDC
NO. 12285
REV -

JOB RETEST PROCEDURES FOR CDU

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	JDC 12202 Data Sheets	▨	▨		▨		
5.b	JDC 12203 Data Sheets	▨	▨		▨		
8	+28 vdc G & N	vdc	27.75		28.25		
9	+28 vdc standby	vdc	28.55		29.05		
16	PIPA torquing not present until after DSKY display change	▨	▨		▨		
18	OG gimbal position	▨	▨		▨		
	MG gimbal position	▨	▨		▨		
	IG gimbal position	▨	▨		▨		
	OG DSKY position (Row 1)	▨	▨		▨		
	MG DSKY position (Row 2)	▨	▨		▨		
	IG DSKY position (Row 3)	▨	▨		▨		
20.a	28 vdc operate/ IMU	vdc	25.8		31.8		
20.b	28 vdc operate/ IMU	vdc	27.75		28.25		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 5

JDC
NO. 12285
REV -

JOB RETEST PROCEDURES FOR CDU

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20.c	28 vdc optics	vdc	25.8		30.8		
20.d	IMU 28 v 800 cps 1%	vac	27.44		28.56		
20.e	Optics 28 v 800 cps 1%	vac	27.44		28.56		
20.f	CDU +4 vdc	vdc	3.8		4.2		
	Noise	v p-p	0.0		0.4		
24.a	IMU 28 v 800 cps 1%	ratio	099875		100125		
24.b	Optics 28 v 800 cps 1%	ratio	099875		100125		
32.a	Trun TPAC indication (0°)	deg	-00.290		+00.290		
32.b	Trun TPAC indication (22.5°)	deg	22.210		22.790		
32.c	Trun TPAC indication (45°)	deg	44.710		45.290		
32.d	Trun TPAC indication (67.5°)	deg	67.210		67.790		
32.e	Trun TPAC indication (90°)	deg	89.210		90.290		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 5

JDC
NO. 12285
REV -

JOB RETEST PROCEDURES FOR CDU

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34.a	Shaft TPAC indication (0°)	deg	-000.16		+000.16		
34.b	Shaft TPAC indication (45°)	deg	044.84		045.16		
34.c	Shaft TPAC indication (90°)	deg	089.84		090.16		
34.d	Shaft TPAC indication (135°)	deg	134.84		135.16		
34.e	Shaft TPAC indication (180°)	deg	179.84		180.16		
34.f	Shaft TPAC indication (225°)	deg	224.84		225.16		
34.g	Shaft TPAC indication (270°)	deg	269.84		270.16		
37	DSKY Row 1 indication (SXT shaft)	deg	270.01		269.99		
	DSKY Row 2 indication (SXT trun)	deg	45.010		44.990		
38	Shaft TPAC indication	deg	269.78		270.12		
	Trun TPAC indication	deg	44.770		45.230		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 5

JDC
NO. 12285
REV -

JOB RETEST PROCEDURES FOR CDU

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
46	Trun CDU fine error	vrms	0.02		0.1		
50	Shaft CDU fine error	vrms	0.02		0.1		
51.a	JDC 12216 Data Sheets	▨	▨		▨		
51.b	JDC 12221 Data Sheets	▨	▨		▨		

DATE ________

JOB RETEST PROCEDURES FOR CGC

JDC 12286 REV. - PAGE 1 OF 10

INITIAL TDRR 36995 D.S. PGS "

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION This JDC provides the retests required to demonstrate the integrity of a replacement CGC in a G & N System configuration.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ND 1021043

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Avoid slewing SXT shaft and trunnion axes into their mechanical stops.

2. Insure that connector assembly (2003099) is removed and cable W226-P1 is connected to CGC test connector before proceeding with this JDC.

NOTE: If VERB display on DSKY contains a number from 11 through 17, KEY REL may flash when DSKY entries are made.

A. PREPARATION

DOWNMODE

1. Downmode system to OIA ON in accordance with JDC 12204.

CGC REMOVAL

2. Disconnect and remove CGC that is to be replaced in accordance with JDC 17104.

INSPECTION

3. Inspect replacement CGC as follows and record observed indications:

a. Inspection status indicators such as tags and stamps to insure all respective subassembly requirements have been met.

b. Harnesses for nicks, scratches, wire abrasions, loose lacing, dents, incapsulant defects, and pin condition.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

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c. Mating surfaces for cracks and foreign material.

d. Markings for legibility, appearance, and proper registration.

e. Surfaces for scratches, dents, nicks, or other obvious defects.

f. All potting material for condition.

g. All plugs and jacks for pin condition.

INSTALLATION

4. Install replacement CGC in accordance with JDC 17104.

TURNON

5. Perform following JDC's in the order listed:

a. JDC 12202

b. JDC 12203

6. Perform JDC 12215 to establish a Master Initialization condition, then place system in ISS STANDBY mode in accordance with JDC 12204.

7. Insure STBY indicator on DSKY is not lighted. If lighted, press and hold PRO (or STBY) pushbutton until indicator goes out. If STBY indicator does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed. Press ALARM RESET pushbutton on CTS Programmer and Monitor panel.

NOTE: Standby Requirements. Allow 2 hours to elapse before proceeding with following exceptions:

a. If G & N system has been power off state for less than five days with gimbals in parked position (IG and OG at 0° and MG at 90° with G & N Mounting Fixture cradle at 32.5°) and system has not been moved, wait 90 seconds before proceeding.

b. If G & N system has been in power off state for less than 15 minutes with gimbals in unparked position, wait 90 seconds before proceeding.

c. If G & N system has been in power off state with gimbals in unparked position for more than 15 minutes but less than 2 hours, allow warmup time equal to the time off before proceeding.

8. Set CROSSBAR CONTROL on Primary Signal Selector panel to 171. Adjust G & N

DATE ________

POWER ADJUST control on Test Control panel until DVM indicates 28.8 (±1.0) vdc. Record indication.

B. PROCEDURE

9. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 60 ENTR

c. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out

d. Observe:

NO ATT and TEMP Lighted

28 VDC IMU STANDBY BUS

10. Set CROSSBAR CONTROL to 172. Adjust G & N POWER ADJUST control until DVM indicates 28.8 (±1.0) vdc. Record indication.

11. Set CROSSBAR CONTROL to 120. Measure and record voltage indicated on DVM.

3200 CPS SUSPENSION POWER

12. Set Counter switches and controls as follows:

a. DISPLAY TIME (N_2) to 10^5

b. DISPLAY RESET to ZERO

c. CLOCK FREQUENCY DIVIDER to 10

d. CLOCK SELECTOR to INT

e. FUNCTION to OFF

f. INPUT SELECTOR to C SENSE

g. SENSE SELECTOR to FWD

h. TRIGGER VOLTAGE ATTN D to 10

i. TRIGGER VOLTAGE fully counterclockwise

j. SAMPLE TIME (N_1) to 032000

k. FUNCTION to RATIO OR PERIOD

13. Set COUNTER INPUT "D" SIGNAL selector on Primary Signal Selector panel to 5. Insure that D SIGNAL pushbutton is lighted.

14. Adjust ATTEN D selector on Counter to highest level that causes triggering. Set corresponding TRIGGER VOLTAGE control to insure Counter starts and stops in approximately 10 seconds. Counter shall indicate approximately 100000. Record Counter indication.

15. Set CROSSBAR CONTROL to 123. Measure and record voltage indicated on DVM (28V 3200 cps feedback).

MASTER CLOCK SYNC

NOTE: Do not perform step 16 if Auxiliary Calibration System is to be used.

16. Insure that JDC 04830 has been performed within the past seven days.

17. Insure CGC power has been on at least 2 hours before proceeding.

18. Set CTS Frequency Counter switches as follows:

a. FUNCTION to FREQ

b. INPUT VOLTS RMS to 6.4

c. SLOPE to +

d. GATE to OPEN

e. TRIGGER LEVEL to CENTER

19. Set FREQ-TIME switch on Frequency Counter to 100-second position (first setting from fully counterclockwise).

DATE ________

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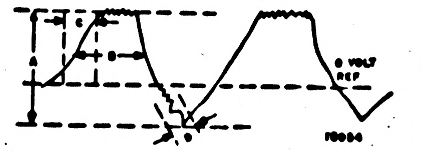
20. Connect plug P6 of cable W259 (2014470-011) to plug P4 of cable W232, and plug P1 of cable W259 to CNTR A connector on CTS Console. Connect a jumper from CNTR A connector on CTS INTERFACE SIGNALS patchboard to FREQ A AC connector on CTS Frequency Counter.

21. Select INPUT VOLTS RMS switch position on Frequency Counter where TRIGGER LEVEL can be properly adjusted. Set TRIGGER LEVEL to center of counting range. Set GATE switch to AUTO. Insure that printer power is on and printer is in record mode. Count output frequency in cps for 15 minutes and record data from printout.

22. Disconnect plug P1 of cable W259 from CNTR A connector and connect P1 to CLOCK (BNC) connector on INTERFACE SIGNALS patchboard on CTS.

23. Connect jumper from CLOCK connector on INTERFACE SIGNALS patchboard to either 1 MEG input channel on CTS Oscilloscope. Insure that all other jumpers are disconnected from CLOCK connectors.

24. Measure and record following characteristics on CTS Oscilloscope:



A. Amplitude, volts peak-to-peak

B. Width at 50% of amplitude

C. Rise time at 10% to 90% amplitude

D. Noise

25. Perform following DSKY operations:

a. Press and hold PRO (or STBY) pushbutton until indicator goes out. If STBY indicator does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed.

b. Press RSET pushbutton.

c. VERB 61 ENTR

d. VERB 36 ENTR

e. Press ALARM RESET pushbutton on CTS Programmer and Monitor panel.

+4 VDC CGC POWER SUPPLY

26. Set CROSSBAR CONTROL to 194. Measure and record voltage indicated on DVM. Use Oscilloscope to measure noise present on +4 vdc supply voltage. Record.

+14 VDC CGC POWER SUPPLY

27. Set CROSSBAR CONTROL to 293. Measure and record voltage indicated on DVM. Use Oscilloscope to measure the noise present on +14 vdc supply voltage. Record.

CGC VOLTAGE MARGIN TEST

28. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

29. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and CONTROL 1 and CONTROL 2 switches to ON.

DATE ________

NOTE: If CONTROL 1 does not vary voltage during performance of step 30, set CONTROL 1 switch to OFF; rotate CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

30. Set VOLTAGE SELECT switch to AGC (+4V) +3V and adjust CONTROL 1 until digital voltmeter on Power Control panel indicates 4.0 (±0.20) vdc.

NOTE: If CONTROL 2 does not vary voltage during performance of step 31, set CONTROL 2 switch to OFF; rotate CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

31. Set VOLTAGE SELECT switch to AGC (+14V) +13V and adjust CONTROL 2 until Meter on Power Control panel indicates 14.0 (±0.40) vdc.

32. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. 77767 ENTR

33. Set CROSSBAR CONTROL to 194 to monitor +4 vdc CGC power supply voltage on DVM.

34. Use CONTROL 1 to adjust +4 vdc CGC power supply voltage to 3.40 vdc. Use CONTROL 2 to adjust +14 vdc CGC power supply voltage to 12.1 vdc and to 16.4 vdc. Use CONTROL 1 again to adjust +4 vdc power supply to 4.60 vdc. Use CONTROL 2 to adjust +14 vdc power supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur. Record.

CGC VOLTAGE FAIL ALARM LIMITS

35. Use CONTROL 1 to set +4 vdc CGC power supply voltage to 4.0 (±0.20) vdc. Use CONTROL 2 to set +14 vdc CGC power supply voltage to 14.0 (±0.40) vdc.

36. Press to extinguish INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

NOTE: Failure indications in step 37 will occur only with MAIN DSKY installed for test or with cable W160-P3 connected to DSKY.

37. Monitor CGC/LGC WARNING NO. 1 lamp on Monitor panel and adjust CONTROL 1 and CONTROL 2 to set +4 and +14 vdc CGC power supplies to values specified below. At each step, a CGC/LGC WARNING NO. 1 shall occur. Record. (Other failure indications may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on

DATE ______

DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc
b. 4.6 vdc and 14.0 vdc
c. 4.0 vdc and 16.4 vdc
d. 4.0 vdc and 12.2 vdc

38. Set CONTROL 1 and CONTROL 2 switches to OFF.

39. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. +00000 ENTR

BMAG ATTITUDE SIGNALS

40. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00013 ENTR
c. 00200 ENTR
d. VERB 25 NOUN 01 ENTR
e. 00042 ENTR
f. 77777 ENTR
g. 77777 ENTR
h. 77777 ENTR
i. VERB 15 NOUN 01 ENTR
j. 00042 ENTR
k. Observe
77777 is displayed in Rows 1, 2 and 3

41. Press SINGLE PULSE pushbutton on XY Interface panel. SINGLE PULSE shall light.

42. Set AGC INPUT COUNTERS selector to 6 and press POSITIVE pushbutton. POSITIVE shall light.

43. Press SINGLE PULSE pushbutton. After COMP ACTY lamp on DSKY flashes on and off, Row 1 display shall change to 00001. Continue actuating SINGLE PULSE pushbutton waiting until COMP ACTY lamp flashes to allow DSKY display to change. Row 1 shall count 00001, 00002, 00003, 00004, 00005, 00006, 00007, 00010 and 00011.

44. Press POSITIVE and NEGATIVE pushbuttons. POSITIVE shall go out and NEGATIVE shall light.

45. Actuate SINGLE PULSE pushbutton as described in step 43. Row 1 shall count 00011, 00010, 00007, 00006, 00005, 00004, 00003, 00002, 00001, 77777, 77776, 77775, 77774, 77773, 77772, 77771, 77770, 77767, and 77766.

46. Set AGC INPUT COUNTERS selector to 7 and press POSITIVE and NEGATIVE pushbuttons. POSITIVE shall light and NEGATIVE shall go out.

47. Repeat steps 43 through 45 except observe DSKY Row 2 for proper indications.

48. Set AGC INPUT COUNTERS selector to 8 and press POSITIVE and NEGATIVE pushbuttons. POSITIVE shall light and NEGATIVE shall go out.

49. Repeat steps 43 through 45 except observe DSKY Row 3 for proper indications.

50. Perform following DSKY operations:

a. VERB 36 ENTR
b. KEY REL indicator may flash; press KEY REL pushbutton
c. VERB 25 NOUN 01 ENTR
d. 00042 ENTR

DATE ______

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e. 00000 ENTR
f. 00000 ENTR
g. 00000 ENTR

51. Insure PSA HTR PWR lamp on Temperature Monitor Control panel is lighted.

52. Set CROSSBAR CONTROL to 175. Adjust G & N POWER ADJUST control until DVM indicates 28.8 (±0.25) vdc. Record indication.

IMU TIME DELAY

53. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 11 NOUN 10 ENTR
c. 00012 ENTR

54. Set Counter switches and control as follows:

a. DISPLAY RESET to ZERO
b. CLOCK FREQUENCY DIVIDER to 10^4
c. CLOCK SELECTOR to INT
d. INPUT SELECTOR to C SENSE
e. SENSE SELECTOR to FWD
f. FUNCTION to COUNT

55. Set CROSSBAR CONTROL to 259.

56. Simultaneously press RESET pushbutton on Counter and PROCEED/ISS OPERATE pushbutton on Test Control panel. NO ATT lamp on DSKY shall light. Observe absence of +120 vdc on DVM.

57. Set FUNCTION selector on Counter to OFF immediately after DSKY display changes from 00030 to 40000 and observe voltage on DVM indicates +120 vdc within 10 seconds. NO ATT lamp on DSKY shall go out.

58. Record time displayed on Counter.

59. Perform following DSKY operations:

a. VERB 40 NOUN 20 ENTR
b. Wait 5 seconds
c. VERB 36 ENTR
d. VERB 41 NOUN 20 ENTR
e. Observe
VERB 21 NOUN 22 Flashing
f. +09000 ENTR
g. Observe
VERB 22 NOUN 22 Flashing
h. +09000 ENTR
i. Observe
VERB 23 NOUN 22 Flashing
j. +09000 ENTR
k. Observe
NO ATT lamp lights
GIMBAL LOCK lamps on DSKY and Monitor panel light

60. Perform following DSKY operations:

a. VERB 06 NOUN 20 ENTR
b. Observe
Row 1 indicates approximately +0900
Row 2 indicates approximately +0900
Row 3 indicates approximately +0900

NOTE: PROG alarm on DSKY may light during performance of step 61. Ignore alarm.

61. Press PROCEED/ISS STANDBY pushbutton on Test Control panel. ISS OPERATE shall go out and ISS STANDBY shall remain lighted.

DATE ______

TURN ON CAGE TEST

62. Perform following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

63. Insure PROCEED portion of PROCEED/ISS OPERATE pushbutton is lighted. Press PROCEED/ISS OPERATE pushbutton. ISS OPERATE shall light and ISS STANDBY shall go out. NO ATT lamp on DSKY shall light.

64. After DSKY display changes from 00030 to 40000 to 00000, perform following DSKY operations:

a. VERB 16 NOUN 20 ENTR

65. Record OG, MG, and IG positions indicated on Gimbal Position Control panel and DSKY. All axes shall indicate approximately 000.00°.

TEMP MON 1 THERMISTOR

66. Measure temp mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2. Use 10K ohm resistor in series with one of the measuring probes. Subtract 10K ohms from measured resistance. Record result.

67. Press PROCEED/ISS STANDBY pushbutton. ISS STANDBY shall light and ISS OPERATE shall go out.

68. Perform following JDC's in the order listed:

a. JDC 12206
b. JDC 12209
c. JDC 12210

69. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON shall light.

70. Insure PROCEED portion of PROCEED/ISS OPERATE pushbutton is lighted. Press PROCEED/ISS OPERATE pushbutton. ISS OPERATE shall light.

71. Set CROSSBAR CONTROL to positions listed below and measure signals on DVM. Measure peak-to-peak noise of steps c and d on Oscilloscope. Record all indications.

Step	Signal	CROSSBAR CONTROL
a.	-28 vdc	124
b.	+28 vdc computer TP	193
c.	CGC +4 vdc	194
d.	CGC +14 vdc	293
e.	120 vdc PIP	259

72. Set CROSSBAR CONTROL to 299, connect direct probes on TPA #2 to terminals listed below, and measure signals on DVM. Record indications.

Step	Signal	TPA #2 Terminals
a.	CGC +4 vdc	TB2-27 (hi) and TB2-25 (lo)
b.	CGC +14 vdc	TB2-26 (hi) and TB2-25 (lo)
c.	+28 vdc computer TP	TB2-28 (hi) and TB2-25 (lo)

73. Set Counter switches and controls as follows:

a. DISPLAY TIME (N_2) to 10^5
b. DISPLAY RESET to ZERO

DATE ______

c. CLOCK FREQUENCY DIVIDER to 10

d. CLOCK SELECTOR to INT

e. INPUT SELECTOR to C SENSE

f. SENSE SELECTOR to FWD

g. TRIGGER VOLTAGE ATTEN D to 10 AC

h. TRIGGER VOLTAGE fully counterclockwise

i. SAMPLE TIME (N_1) to 008000

j. FUNCTION to RATIO OR PERIOD

74. Insure D SIGNAL portion of D SIGNAL/D PULSE pushbutton on Primary Signal Selector panel is lighted. Set COUNTER INPUT "D" SIGNAL selector to 1.

75. Adjust TRIGGER VOLTAGE ATTEN D selector on Counter to highest attenuation level that causes triggering. Set TRIGGER VOLTAGE control to insure Counter starts and stops in approximately 10 seconds. Counter shall indicate approximately 100000.

76. Set COUNTER INPUT "D" SIGNAL selector on Primary Signal Selector panel and SAMPLE TIME (N_1) on Counter as listed below and measure frequencies of each signal. Record each counter indication.

Step	Signal	COUNTER INPUT "D" SIGNAL Selector	SAMPLE TIME (N_1)
a.	IMU 28 v 800 cps 1%	1	008000
b.	Optics 28 v 800 cps 1%	2	008000
c.	28 v 3200 cps feedback	5	032000
d.	115 v 400 cps	7	004000

LOW BUS VOLTAGE

77. Set CROSSBAR CONTROL to 175. Adjust G & N POWER ADJUST control until DVM indicates 25.8 (+0.25, −0.0) vdc.

78. Repeat steps 71 through 76 with following exceptions:

a. Step 71 measure items c and d only

b. Step 72 measure items a and b only

c. Step 76 measure items a, b and c only

HIGH BUS VOLTAGE

79. Set CROSSBAR CONTROL to 175. Adjust G & N POWER ADJUST control until DVM indicates 31.8 (+0.0, −0.25) vdc.

80. Repeat steps 71 through 76 with following exceptions:

a. Step 71 measure items c and d only

b. Step 72 measure items a and b only

c. Step 76 measure items a, b, and c only

NORMALIZATION OF SYSTEM

81. Set CROSSBAR CONTROL to 220. Adjust G & N POWER ADJUST control until DVM indicates 28.0 (±0.25) vdc. Record indication.

CGC +4 VDC CONTROL 1 (ACE)

82. Set CROSSBAR CONTROL to 194. Measure and record voltage indicated on DVM.

83. Press INTERFACE LOAD TEST pushbutton on Test Selector panel. INTERFACE LOAD TEST shall light.

84. Set INTERFACE LOAD TEST selector to 7.

85. Press TEST START pushbutton. TEST START shall light.

86. Measure and record voltage indicated on DVM.

DATE ________

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87. Press TEST STOP pushbutton. TEST START shall go out.

88. Calculate CGC +4 vdc voltage change.

CGC +14 VDC CONTROL 2 (ACE)

89. Set CROSSBAR CONTROL to 293. Measure and record voltage indicated on DVM.

90. Press INTERFACE LOAD TEST pushbutton. INTERFACE LOAD TEST shall light.

91. Set INTERFACE LOAD TEST selector to 8.

92. Press TEST START pushbutton. TEST START shall light.

93. Measure and record voltage indicated on DVM.

94. Press TEST STOP pushbutton. TEST START shall go out. Press to extinguish INTERFACE LOAD TEST pushbutton.

95. Calculate CGC +14 vdc voltage change.

96. Perform following JDC's in the order listed:

a. JDC 12218

b. JDC 12221

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC
NO. 12286
REV -
INITIAL TORR 36995

JOB RETEST PROCEDURES FOR CGC

ASSEMBLY UNDER TEST

TITLE ____________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____________ SER. NO. ________ ________ CAL DATE

NAME ____________ SER. NO. ________ ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	REJ	ACC
3.a	Applicable inspections		
3.b	Harnesses		
3.c	Mating surfaces		
3.d	Markings		
3.e	Surfaces		
3.f	Potting material		
3.g	Plugs and jacks		
	REMARKS:		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC
NO. 12286
REV -

JOB RETEST PROCEDURES FOR CGC

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	JDC 12202 Data Sheets	▨	▨		▨		
5.b	JDC 12203 Data Sheets	▨	▨		▨		
8	G & N 28 vdc	vdc	27.8		29.8		
10	28 vdc standby bus	vdc	27.8		29.8		
11	28 vdc standby bus	vdc	27.8		29.8		
14	Counter indication	counts	099968		100032		
15	28 v 3200 cps feedback	vac	28.04		29.16		
21	CLOCK SYNC pulses						
	Printout 1	cps	XXXX2399800		XXXX2400200		
	Printout 2	cps	XXXX2399800		XXXX2400200		
	Printout 3	cps	XXXX2399800		XXXX2400200		
	Printout 4	cps	XXXX2399800		XXXX2400200		
	Printout 5	cps	XXXX2399800		XXXX2400200		
	Printout 6	cps	XXXX2399800		XXXX2400200		
	Printout 7	cps	XXXX2399800		XXXX2400200		
	Printout 8	cps	XXXX2399800		XXXX2400200		
	Printout 9	cps	XXXX2399800		XXXX2400200		
24	Pulse amplitude (A)	vp-p	4.0		14.0		
	Pulse width (B)	usec	0.25		0.75		
	Pulse rise time (C)	usec	▨		0.2		
	Pulse noise (D)	mvp-p	▨		200		

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 **OF** 7

JDC NO. 12286
REV. -

JOB RETEST PROCEDURES FOR CGC

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
26	+4 vdc CGC power supply	vdc	+3.80		+4.20		
	Noise	v p-p	0.0		0.4		
27	+14 vdc CGC power supply	vdc	+13.6		+14.4		
	Noise	v p-p	0.0		0.4		
34	No fail alarms		▨		▨		
37.a	CGC/LGC WARNING NO. 1 lamp	lights	▨		▨		
37.b	CGC/LGC WARNING NO. 1 lamp	lights	▨		▨		
37.c	CGC/LGC WARNING NO. 1 lamp	lights	▨		▨		
37.d	CGC/LGC WARNING NO. 1 lamp	lights	▨		▨		
43 thru 49	Displays (reacted as specified)	▨	▨		▨		
52	28 vdc standby bus	vdc	28.55		29.05		
58	Elapsed time	sec	85		95		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 **OF** 7

JDC NO. 12286
REV. -

JOB RETEST PROCEDURES FOR CGC

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
65	OG gimbal position	▨	▨		▨		
	MG gimbal position	▨	▨		▨		
	IG gimbal position	▨	▨		▨		
	OG DSKY position (Row 1)	▨	▨		▨		
	MG DSKY position (Row 3)	▨	▨		▨		
	IG DSKY position (Row 2)	▨	▨		▨		
66	Temp Mon 1 thermistor resistance	ohms	1400		13,250		
68.a	JDC 12206 Data Sheets	▨	▨		▨		
68.b	JDC 12209 Data Sheets	▨	▨		▨		
68.c	JDC 12210 Data Sheets	▨	▨		▨		
71.a	-28 vdc*	vdc	-21.5		-33.5		
71.b	+28 vdc computer TP	vdc	25.8		31.8		
71.c	CGC +4 vdc	vdc	3.85		4.15		
	Noise	v p-p	0.0		0.4		

*Correct this measurement using "MULT BY" factor to obtain the true value.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 **OF** 7

JDC NO. 12286
REV. -

JOB RETEST PROCEDURES FOR CGC

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
71.d	CGC +14 vdc	vdc	13.6		14.4		
	Noise	v p-p	0.0		0.4		
71.e	120 vdc PIP	vdc	114		126		
72.a	CGC +4 vdc	vdc	3.8		4.2		
72.b	CGC +14 vdc	vdc	13.6		14.4		
72.c	+28 vdc computer TP	vdc	25.8		31.8		
76.a	IMU 28 v 800 cps 1%	ratio	099875		100125		
76.b	Optics 28 v 800 cps 1%	ratio	099875		100125		
76.c	28 v 3200 cps feedback	ratio	099968		100032		
76.d	115 v 400 cps	ratio	095000		105000		
78.a (71.c)	CGC +4 vdc	vdc	3.8		4.2		
	Noise	v p-p	0.0		0.4		
78.a (71.d)	CGC +14 vdc	vdc	13.6		14.4		
	Noise	v p-p	0.0		0.4		
78.b (72.a)	CGC +4 vdc	vdc	3.8		4.2		
78.b (72.b)	CGC +14 vdc	vdc	13.6		14.4		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 **OF** 7

JDC NO. 12286
REV. -

JOB RETEST PROCEDURES FOR CGC

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
78.c (76.a)	IMU 28 v 800 cps 1%	ratio	099875		100125			
78.c (76.b)	Optics 28 v 800 cps 1%	ratio	099875		100125			
78.c (76.c)	28 v 3200 cps feedback	ratio	099968		100032			
80.a (71.c)	CGC +4 vdc	vdc	3.8		4.2			
	Noise	v p-p	0.0		0.4			
80.a (71.d)	CGC +14 vdc	vdc	13.6		14.4			
	Noise	v p-p	0.0		0.4			
80.b (72.a)	CGC +4 vdc	vdc	3.8		4.2			
80.b (72.b)	CGC +14 vdc	vdc	13.6		14.4			
80.c (76.a)	IMU 28 v 800 cps 1%	ratio	099875		100125			
80.c (76.b)	Optics 28 v 800 cps 1%	ratio	099875		100125			
80.c (76.c)	28 v 3200 cps feedback	ratio	099968		100032			
81	28 vdc G & N	vdc	27.75		28.25			
82	CGC +4 vdc	vdc	3.8		4.2			(a)
86	Control 1 voltage	vdc	▨		▨			(b)

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC
NO. 12286
REV. -

JOB RETEST PROCEDURES FOR CGC

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
88	Line a - Line b	vdc	0.4		1.0			
89	CGC +14 vdc	vdc	13.6		14.4			(c)
93	Control 2 voltage	vdc	▨		▨			(d)
95	Line c - Line d	vdc	1.0		5.0			
96.a	JDC 12218 Data Sheets	▨	▨		▨			
96.b	JDC 12221 Data Sheets	▨	▨		▨			

DATE ______

JDC 12287 REV. - PAGE 1 OF 3

JOB RETEST PROCEDURES FOR DSKY

INITIAL TDRR 36995 D.S. PGS 2

SUBSYSTEM G AND N SYSTEM

ASSY.

DESCRIPTION This JDC provides the retests required to demonstrate the integrity of a replacement DSKY in a G & N System configuration.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES ND 1021043

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that cable W226-P1 is removed and connector assembly (2003099) is connected to CGC test connector before proceeding with this JDC.

NOTE: If VERB display on DSKY contains a number from 11 through 17, KEY REL may flash when DSKY entries are made.

A. PREPARATION

DOWNMODE

1. Downmode the system to OIA ON in accordance with JDC 12204.

DSKY REMOVAL

2. Disconnect and remove DSKY that is to be replaced in accordance with JDC 17104.

INSPECTION

3. Inspect replacement DSKY as follows and record observed indications:

a. Inspection status indicators such as tags and stamps to insure all respective subassembly requirements have been met.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

JOB RETEST PROCEDURES FOR DSKY | JDC 12287 REV - PAGE 2 OF 3

SUBSYSTEM G AND N SYSTEM | ASSY

b. Harnesses for nicks, scratches, wire abrasions, loose lacing, dents, incapsulant defects, and pin condition.

c. Mating surfaces for cracks and foreign material.

d. Markings for legibility, appearance, and proper registration.

e. Surfaces for scratches, dents, nicks, or other obvious defects.

f. All potting material for condition.

g. All plugs and jacks for pin condition.

INSTALLATION

4. Install replacement DSKY in accordance with JDC 17104.

TURNON

5. Perform following JDC's in the order listed:

a. JDC 12202

b. JDC 12203

6. Perform JDC 12215 to establish a Master Initialization condition, then place system in ISS STANDBY mode in accordance with JDC 12204.

7. Insure STBY indicator on DSKY is not lighted. If lighted, press and hold PRO (or STBY) pushbutton until indicator goes out. If STBY indicator does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed. Press ALARM RESET pushbutton on CTS Programmer and Monitor panel.

B. PROCEDURE

8. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 60 ENTR

c. Press and hold PRO (or STBY) pushbutton until STBY indicator lights.

d. Observe

NO ATT and TEMP indicators are lighted.

9. Perform following DSKY operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out.

b. Press RSET pushbutton.

c. VERB 61 ENTR

d. VERB 36 ENTR

10. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

11. Insure G & N Mounting Fixture cradle assembly is at 32.5°.

12. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 21 NOUN 27 ENTR

c. 00011 ENTR

13. Verify that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's

b. 8's

c. 7's

d. 6's

DATE ______

JOB RETEST PROCEDURES FOR DSKY | JDC 12287 REV - PAGE 3 OF 3

SUBSYSTEM G AND N SYSTEM | ASSY

e. 5's

f. 4's

g. 3's

h. 2's

i. 1's

j. 0's

k. Minus signs in Row 1, Row 2 and Row 3

l. VERB-NOUN Flashing

m. COMP ACTY

} on concurrently for 5 seconds

n. Plus signs in Row 1, Row 2, and Row 3

o. VERB-NOUN Flashing

p. COMP ACTY

} on concurrently for 5 seconds

14. Perform following DSKY operations:

a. VERB 35 ENTR

15. Verify the following DSKY displays illuminate for 5 seconds:

a. UPLINK ACTY

b. NO ATT (Momentarily on)

c. STBY

d. KEY REL Flashing

e. TEMP

f. GIMBAL LOCK

g. PROG

h. RESTART

i. TRACKER

j. OPR ERR Flashing

} on concurrently for 5 seconds

k. VERB 88 NOUN 88 Flashing

l. PGNS, CMC and ISS lamps on Indicator Control panel

m. +88888 in Row 1, Row 2 and Row 3

} on concurrently for 5 seconds (CMC remains on approximately 60 seconds after other lamps go out)

16. Verify that after displays a through l of step 15 go out, +88888's remain displayed in Row 1, Row 2 and Row 3, and VERB 88, NOUN 88 remain lighted.

MANUAL DSKY OPERATION CHECK

17. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR

b. Observe

VERB 24 NOUN 01 Flashing

c. 01700 ENTR

d. Observe

VERB 21 NOUN 01 Flashing

e. +12345 ENTR

f. Observe

VERB 22 NOUN 01 Flashing

g. -67890 Do NOT press ENTR

h. Observe

Row 1 contains +12345 and Row 2 contains -67890

18. Press CLR pushbutton twice on DSKY. Observe Row 1 and Row are blank and VERB 21 and NOUN 01 continue flashing.

19. Perform following DSKY operations:

a. VERB 36 ENTR

b. Observe

DSKY blanks except PROG indicates 00

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12287
REV -
INITIAL TDRR 36995

JOB RETEST PROCEDURES FOR DSKY

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE

NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME / AFFILIATION APPROVED BY ______ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	REJ	ACC
3.a	Applicable Inspections		
3.b	Harnesses		
3.c	Mating Surfaces		
3.d	Markings		
3.e	Surfaces		
3.f	Potting Material		
3.g	Plugs and Jacks		
	REMARKS:		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12287
REV. -

JOB RETEST PROCEDURES FOR DSKY

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5. a	JDC 12202 Data Sheets	▨	▨		▨		
5. b	JDC 12203 Data Sheets	▨	▨		▨		
6 thru 19	Displays	All DSKY character and condition lamps performed as specified.					

DATE ______

JOB RETEST PROCEDURES FOR G & N INTERCONNECTION HARNESS F

JDC 12297 REV. - PAGE 1 OF 4
INITIAL TDRR 36995 D.S. PGS 3

SUBSYSTEM G AND N SYSTEM
ASSY.

DESCRIPTION

This JDC provides the retests required to demonstrate the integrity of a replacement G&N Interconnection Harness F in a G & N System configuration.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES
ND 1021043

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Avoid slewing SXT shaft and trunnion axes into their mechanical stops. 2. Insure that cable W226-P1 is removed and connector assembly (2003099) is connected to CGC test connector before performing retest.
NOTE: If VERB display on DSKY contains a number from 11 through 17, KEY REL may flash when DSKY entries are made.

A. PREPARATION

DOWNMODE

1. Downmode system to OIA ON in accordance with JDC 12204.

G & N INTERCONNECTION HARNESS F REMOVAL

2. Disconnect and remove G & N Interconnection Harness F that is to be replaced in accordance with JDC 17104.

INSPECTION

3. Inspect replacement G & N Interconnection Harness F as follows and record observed indications:

a. Inspection status indicators such as tags and stamps to insure all respective subassembly requirements have been met.

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE ______

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b. Harnesses for nicks, scratches, wire abrasions, loose lacing, dents, incapsulant defects, and pin condition.
c. Mating surfaces for cracks and foreign material.
d. Markings for legibility, appearance, and proper registration.
e. Surfaces for scratches, dents, nicks, or other obvious defects.
f. All potting material for condition.
g. All plugs and jacks for pin condition.

INSTALLATION

4. Install replacement G & N Interconnection Harness F in accordance with JDC 17104.

TURNON

5. Perform following JDC's in the order listed:
a. JDC 12202
b. JDC 12203

6. Perform JDC 12215 to establish a Master Initialization condition, then place system in ISS STANDBY mode in accordance with JDC 12204.

7. Insure STBY indicator on DSKY is not lighted. If lighted, press and hold PRO (or STBY) pushbutton until indicator goes out. If STBY indicator does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed. Press ALARM RESET pushbutton on CTS Programmer and Monitor panel.

B. PROCEDURE

8. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON shall light.

9. Set CROSSBAR CONTROL on Primary Signal Selector panel to 174. Adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28.0 (±0.25) vdc.

10. Set CROSSBAR CONTROL on Primary Signal Selector panel to positions listed below and measure corresponding signals on DVM. Record DVM indications.

Step	Signal	CROSSBAR CONTROL
a.	28 vdc optics	200
b.	Optics 28 v 800 cps 1%	101

11. Set CROSSBAR CONTROL to 199. Connect buffered probes to TPA #2 terminals listed below and measure corresponding signal on DVM. Record DVM indication:

Step	Signal	TPA #2 Terminals
a.	Optics 800 cps 5%	TB5-35 (hi) and TB5-48 (lo)

NOTE: Step 12 applies to Indicator Control panel 2021290 only.

DATE ______

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12. Set switches on Indicator Control panel as follows:
a. OPTICS ZERO to OFF, then to ZERO for a minimum of 20 seconds, and return to OFF.
b. OPTICS TEL TRUN to SLAVE TO SXT
c. OPTICS COUPLING to DIRECT
d. OPTICS MODE to MAN
e. OPTICS SPEED to HI

NOTE: Step 13 applies to all Indicator Control panels except 2021290.

13. Set switches on Indicator Control panel as follows:
a. OPTICS MODE to MAN, then to ZERO for a minimum of 20 seconds, and return to MAN.
b. OPTICS CONTROLLER SPEED to HI.
c. OPTICS CONTROLLER COUPLING to DIRECT.
d. OPTICS TRACKER to OFF.
e. OPTICS TELESCOPE TRUNNION to SLAVE TO SXT.

14. Set CROSSBAR CONTROL to 202 and monitor SCT Trunnion MDA Output Mon. #1 on Oscilloscope A.

15. Measure and record steady state peak-to-peak voltage indicated on Oscilloscope after initial acceleration transient while holding Optics Hand Controller to upper limit not longer than 10 seconds. Release Optics Hand Controller.

16. Set CROSSBAR CONTROL to 110 and monitor SCT Shaft MDA Output Mon. #1 on Oscilloscope A.

17. Measure and record steady state peak-to-peak voltage indicated on Oscilloscope after initial acceleration transient while holding Optics Hand Controller to right limit not longer than 10 seconds. Release Optics Hand Controller.

18. Using Optics Hand Controller, position the SXT trunnion axis between 0° and 10° as indicated by Trunnion TPAC.

NOTE: Step 19 applies to Indicator Control 2021290 only.

19. Set OPTICS ZERO switch on Indicator Control panel to ZERO.

NOTE: Step 20 applies to all Indicator Control panels except 2021290.

20. Set OPTICS MODE switch on Indicator Control panel to ZERO.

21. When all signals reach steady state values, perform following DSKY operations:
a. VERB 06 NOUN 55 ENTR
b. Record Row 1 and Row 2 indications.

NOTE: Step 22 applies to Indicator Control panel 2021290 only.

22. Set OPTICS ZERO switch to OFF.

NOTE: Step 23 applies to all Indicator Control panels except 2021290.

23. Set OPTICS MODE switch to MAN.

DATE ______

---

24. Set CROSSBAR CONTROL on Primary Signal Selector panel to 105 to monitor SCT trunnion MDA tach mon on PAVM.

25. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to upper limit not longer than 20 seconds. Release Optics Hand Controller.

26. Set CROSSBAR CONTROL to 204 to monitor SCT shaft MDA tach mon on PAVM.

27. Measure and record voltage indicated on PAVM while holding Optics Hand Controller to right limit not longer than 20 seconds. Release Optics Hand Controller.

28. Using Optics Hand Controller, position SXT trunnion axis between 0° and 10° as indicated by Trunnion TPAC.

NOTE: Step 29 applies to Indicator Control panel 2021290 only.

29. Set OPTICS ZERO switch to ZERO. After approximately 20 seconds, set OPTICS ZERO switch to OFF.

NOTE: Step 30 applies to all Indicator Control panels except 2021290.

30. Set OPTICS MODE switch to ZERO. After approximately 20 seconds, set OPTICS MODE switch to MAN.

31. Set CROSSBAR CONTROL to positions listed below and measure and record total and in-phase voltage of each corresponding voltage on PAVM:

Step	CROSSBAR CONTROL	Signal
a.	205	Shaft fine error
b.	206	Trun fine error

32. Rotate RETICLE BRIGHTNESS control on Indicator Control panel fully downward.

33. Rotate RETICLE BRIGHTNESS control upward while observing SCT reticle pattern and SCT TPAC. Verify that reticle and TPAC lamps vary from dim to bright as control is rotated.

34. Press OPTICS POWER ON pushbutton on Test Control panel. OPTICS POWER ON shall go out.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC
NO. 12297
REV -
INITIAL TDRR 36995

JOB RETEST PROCEDURES FOR G & N INTERCONNECTION HARNESS F

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	REJ	ACC
3.a	Applicable inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in aluminum tape. Cracking or separation caused by flexing of harness branches and connectors is not considered detrimental and shall be accepted as a normal occurrence. In areas where tape has been loosened, re-stick tape by pressing it tightly against harness bundle.		
3.b	Harnesses		
3.c	Mating surfaces		
3.d	Markings		
3.e	Surfaces		
3.f	Potting material		
3.g	Plugs and jacks		
	REMARKS:		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC
NO. 12297
REV -

JOB RETEST PROCEDURES FOR G & N INTERCONNECTION HARNESS F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
5.a	JDC 12202 Data Sheets	▨	▨		▨		
5.b	JDC 12203 Data Sheets	▨	▨		▨		
10.a	28 vdc Optics	vdc	25.8		30.8		
10.b	Optics 28 v 800 cps 1%	vac	27.44		28.56		
11.a	Optics 28 v 800 cps 5%*	vac	*26.52		*29.48		
15	SCT trunnion MDA output	v p-p	5		15		
17	SCT shaft MDA output	v p-p	10		35		
21	DSKY Row 1 display (shaft angle)	deg	-00003		+00002		
	DSKY Row 2 display (trunnion angle)	deg	-00007		+00006		
25	SCT trunnion MDA tach mon	vrms	0.5		1.2		
27	SCT shaft MDA tach mon	vrms	2.0		4.6		

*Correct this measurement using "MULT BY" factor to obtain true value.

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12297
REV -

JOB RETEST PROCEDURES FOR G & N INTERCONNECTION HARNESS F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
31.a	Shaft fine error	vrms	0.0		0.1		
31.b	Trun fine error	vrms	0.0		0.1		

DATE ______

JOB LEM G & N SYSTEM VISUAL INSPECTION | JDC 12600 REV. A PAGE 1 OF 2
INITIAL TDRR 25341 D.S. PGS 10

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Final inspection of workmanship, quantity, markings and prior compliance. Time required for LEM G & N system testing is recorded.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-24-66	29096	2	10	MM	ACM

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that the LEM G & N System has been finished in a thorough workmanship like manner, without subassembly separation.

PROCEDURE

1. Inspect the following equipment in accordance with step 2 without G & N System subassembly separation.

NOTE: If continuing from ISS Testing inspect items e, f, g, h, and i only.

a. Inertial Measurement Unit
b. Pulse Torque Assembly
c. Coupling Display Unit
d. Power Servo Assembly
e. LEM Guidance Computer
f. LEM DSKY
g. Computer Control and Reticle Dimmer Assembly
h. "A" Harness Assembly
i. "B" Harness Assembly

2. Record the indications resulting from the following inspections performed on the equipment called out in step 1.

a. Insure that all units have met their respective subassembly requirements by a review of inspection status indications such as tags and stamps.
b. Harness for nicks, scratches, wire abrasions, loose lacing, burs, dents, encapsulant defects, and pin condition.
c. Mating surfaces for cracks and

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JOB LEM G & N SYSTEM VISUAL INSPECTION | JDC 12600 REV A PAGE 2 OF 2

SUBSYSTEM LEM G & N SYSTEM | ASSY

foreign material.

d. Markings for legibility, appearance and proper registration.
e. Surfaces for scratches, dents, nicks or other obvious defects.
f. All potting material for condition.
g. All plugs and jacks for pin conditions.

G & N SYSTEM TEST TIME

3. Observe and record the following ETI readings indicated on the Power Supply Load Panel:

a. ISS OPERATE
b. WHEEL
c. AGC/LGC
d. OPTICS
e. OIA ON
f. ISS STANDBY

DATE 18 JAN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12600
REV. A
INITIAL TDRR 25341

JOB LEM G & N SYSTEM VISUAL INSPECTION

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	INERTIAL MEASUREMENT UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 10

TEST HISTORY
DATE START ______ END ______
TIME START ______ END ______ SYSTEM NO.
OPERATOR ______

JDC
NO. 12600
REV. A

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	PULSE TORQUE ASSEMBLY		
A 2.a	Applicable Inspections		
A 2.b	Harnesses		
A 2.c	Mating Surfaces		
A 2.d	Markings		
A 2.e	Surfaces		
2.f	Potting Material		
A 2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 **OF** 10

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. A

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	COUPLING DISPLAY UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 **OF** 10

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. A

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	POWER SERVO ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 **OF** 10

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. A

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	LEM GUIDANCE COMPUTER		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 **OF** 10

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. A

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	VALUE	UNITS
	LEM DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC 12600 REV. B PAGE 1 OF 2
INITIAL TDRR 25341 D.S. PGS 10

SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION Final inspection of workmanship, quantity, markings and prior compliance. Time required for LEM G & N system testing is recorded.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
(M) A	5-24-66	29096	2	10	MM	ACM
B	7-12-67	34159	-	7,8,9	SB	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that the LEM G & N System has been finished in a thorough workmanship like manner, without subassembly separation.

PROCEDURE

1. Inspect the following equipment in accordance with step 2 without G & N System subassembly separation.

NOTE: If continuing from ISS Testing inspect items e, f, g, h, and i only.

a. Inertial Measurement Unit
b. Pulse Torque Assembly
c. Coupling Display Unit
d. Power Servo Assembly
e. LEM Guidance Computer
f. LEM DSKY
g. Computer Control and Reticle Dimmer Assembly
h. "A" Harness Assembly
i. "B" Harness Assembly

2. Record the indications resulting from the following inspections performed on the equipment called out in step 1.

a. Insure that all units have met their respective subassembly requirements by a review of inspection status indications such as tags and stamps.
b. Harness for nicks, scratches, wire abrasions, loose lacing, burs, dents, encapsulant defects, and pin condition.
c. Mating surfaces for cracks and

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

FORM 00143
Clg. 7-23-65

JOB LEM G & N SYSTEM VISUAL INSPECTION
JDC 12600 REV B PAGE 2 OF 2

SUBSYSTEM LEM G & N SYSTEM
ASSY

foreign material.
d. Markings for legibility, appearance and proper registration.
e. Surfaces for scratches, dents, nicks or other obvious defects.
f. All potting material for condition.
g. All plugs and jacks for pin conditions.

G & N SYSTEM TEST TIME

3. Observe and record the following ETI readings indicated on the Power Supply Load Panel:

a. ISS OPERATE
b. WHEEL
c. AGC/LGC
d. OPTICS
e. OIA ON
f. ISS STANDBY

DATE 18 JAN 66

FORM 00143
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12600
REV. B
INITIAL TDRR 25341

JOB LEM G & N SYSTEM VISUAL INSPECTION

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION ____
TIME ____ START ____ END ____ TOTAL ELAPSED ____

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION
APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	INERTIAL MEASUREMENT UNIT		
A 2.a	Applicable Inspections		
A 2.b	Harnesses		
A 2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
A 2.f	Potting Material		
A 2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

FORM 00149
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 10

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12600
REV. B

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	PULSE TORQUE ASSEMBLY		
A 2.a	Applicable Inspections		
A 2.b	Harnesses		
A 2.c	Mating Surfaces		
A 2.d	Markings		
A 2.e	Surfaces		
A 2.f	Potting Material		
A 2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 **OF** 10

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12600
REV. B

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	COUPLING DISPLAY UNIT		
A 2.a	Applicable Inspections		
A 2.b	Harnesses		
2.c	Mating Surfaces		
A 2.d	Markings		
A 2.e	Surfaces		
A 2.f	Potting Material		
A 2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 **OF** 10

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12600
REV. B

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	POWER SERVO ASSEMBLY		
A 2.a	Applicable Inspections		
A 2.b	Harnesses		
A 2.c	Mating Surfaces		
A 2.d	Markings		
A 2.e	Surfaces		
A 2.f	Potting Material		
A 2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 **OF** 10

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12600
REV. B

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	LEM GUIDANCE COMPUTER		
A 2.a	Applicable Inspections		
A 2.b	Harnesses		
A 2.c	Mating Surfaces		
A 2.d	Markings		
A 2.e	Surfaces		
A 2.f	Potting Material		
A 2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 **OF** 10

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12600
REV. B

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	VALUE	UNITS
	LEM DSKY		
A 2.a	Applicable Inspections		
A 2.b	Harnesses		
A 2.c	Mating Surfaces		
A 2.d	Markings		
A 2.e	Surfaces		
A 2.f	Potting Material		
A 2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. B

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurrence. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 8 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. B

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	"A" HARNESS ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurrence. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 9 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. B

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	"B" HARNESS ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurrence. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC
NO. 12600
REV. B

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.a	ISS OPERATE Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS OPERATE Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.b	WHEEL Elapsed Time Test Start	hrs	▨		▨	▨	▨
	WHEEL Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.c	AGC/LGC Elapsed Time Test Start	hrs	▨		▨	▨	▨
	AGC/LGC Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.d	OPTICS Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OPTICS Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.e	OIA ON Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OIA ON Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.f	ISS STANDBY Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS STANDBY Elapsed Time Test Complete	hrs	▨		▨	▨	▨

DATE 18 JAN 66

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC 12600 **REV.** C **PAGE** 1 **OF** 3
INITIAL TDRR 25341 **D.S. PGS** 0

SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION Final inspection of workmanship, quantity, markings and prior compliance. Time required for LEM G & N system testing is recorded.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-24-66	29096	2	10	MM	ACM
B	7-12-67	34159	-	7,8,9	SB	-
C	3-22-68	35903	1	-	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that the LEM G & N System has been finished in a thorough workmanship like manner, without subassembly separation.

PROCEDURE

1. Inspect the following equipment in accordance with step 2 without G & N System subassembly separation.

NOTE: If continuing from ISS Testing inspect items e, f, g, h, and i only.

a. Inertial Measurement Unit
b. Pulse Torque Assembly
c. Coupling Display Unit
d. Power Servo Assembly
e. LEM Guidance Computer
f. LEM DSKY
g. Computer Control and Reticle Dimmer Assembly
h. "A" Harness Assembly

NOTE: In handling microdot connectors, observe the following precautions. At all times, keep in mind the fact that microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JOB LEM G & N SYSTEM VISUAL INSPECTION | **JDC** 12600 **REV** C **PAGE** 2 **OF** 3

SUBSYSTEM LEM G & N SYSTEM | **ASSY**

1. When the plug is disengaged from the receptacle, the ENGAGE marks on the locking ring and main connector body should be aligned and the locking ring should be immovable under light pressure. (If the ENGAGE marks are not aligned at disengagement and/or the locking ring can be rotated, the connector is defective.)

2. The plug is mated to the receptacle using straight-line, push-in, hand pressure. Full engagement is indicated by an audible click. After engagement, the locking ring should be free to rotate 1/8 turn to lock position when the plug and receptacle are aligned. (If the ring cannot be rotated, the plug and receptacle are not fully engaged. If the connection does not hold with the ring in the LOCK position, the connector is defective.)

3. Connectors are disengaged using special tool FA 757702-006 or special tool FA 757702-007. The locking ring is rotated from LOCK to ENGAGE and the finger blade(s) of the tool are inserted between plug and receptacle. Pressure on the tool handle(s) forces connectors apart. Manual disconnection is not recommended since connector damage may result. (If the connector halves can be separated without rotating the ring to ENGAGE or if the ring will not rotate from LOCK to ENGAGE, the connector is defective.)

4. Protective covers for exposed microdot connectors are inserted by hand pressure but should be removed using special connector cover removal tool FA 757702-005.

i. "B" Harness Assembly

2. Record the indications resulting from the following inspections performed on the equipment called out in step 1.

a. Insure that all units have met their respective subassembly requirements by a review of inspection status indications such as tags and stamps.
b. Harness for nicks, scratches, wire abrasions, loose lacing, burrs, dents, encapsulant defects, and pin condition.
c. Mating surfaces for cracks and foreign material.

DATE 18 JAN 66

JOB LEM G & N SYSTEM VISUAL INSPECTION | **JDC** 12600 **REV** C **PAGE** 3 **OF** 3

SUBSYSTEM LEM G & N SYSTEM | **ASSY**

d. Markings for legibility, appearance and proper registration.
e. Surfaces for scratches, dents, nicks or other obvious defects.
f. All potting material for condition.
g. All plugs and jacks for pin conditions.

G & N SYSTEM TEST TIME

3. Observe and record the following ETI readings indicated on the Power Supply Load Panel:

a. ISS OPERATE
b. WHEEL
c. AGC/LGC
d. OPTICS
e. OIA ON
f. ISS STANDBY

DATE 18 JAN 6?

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 10

NO. 12600 JDC
REV. C
INITIAL TDRR 25341

JOB LEM G & N SYSTEM VISUAL INSPECTION

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	INERTIAL MEASUREMENT UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV C

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	PULSE TORQUE ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV C

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	COUPLING DISPLAY UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV C

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	POWER SERVO ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV C

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	LEM GUIDANCE COMPUTER		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. C

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	VALUE	UNITS
	LEM DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. C

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurrence. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 8 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. C

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	"A" HARNESS ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurrence. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 9 OF 10

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12600
REV. C

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	"B" HARNESS ASSEMBLY		
2.a	Applicable Inspections		
	NOTE: During normal handling of harnesses wrapped with aluminum tape, small cracks or splitting may occur in the aluminum tape. Cracking or separation caused by flexing of the harness branches and connectors is not considered detrimental and shall be accepted as a normal occurrence. In areas where the tape has been loosened, restick by pressing tape tightly against harness bundle.		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE 18 JAN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC
NO. 12600
REV. C

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.a	ISS OPERATE Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS OPERATE Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.b	WHEEL Elapsed Time Test Start	hrs	▨		▨	▨	▨
	WHEEL Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.c	AGC/LGC Elapsed Time Test Start	hrs	▨		▨	▨	▨
	AGC/LGC Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.d	OPTICS Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OPTICS Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.e	OIA ON Elapsed Time Test Start	hrs	▨		▨	▨	▨
	OIA ON Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.f	ISS STANDBY Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS STANDBY Elapsed Time Test Complete	hrs	▨		▨	▨	▨

DATE 18 JAN 66

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC 12600 REV. - PAGE 1 OF 2

INITIAL TDRR 25341 D.S. PGS 10

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Final inspection of workmanship, quantity, markings and prior compliance. Time required for LEM G & N system testing is recorded.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Insure that the LEM G & N System has been finished in a thorough workmanship like manner, without subassembly separation.

PROCEDURE

1. Inspect the following equipment in accordance with step 2 without G & N System subassembly separation.

NOTE: If continuing from ISS Testing inspect items e, f, g, h, and i only.

a. Inertial Measurement Unit
b. Pulse Torque Assembly
c. Coupling Display Unit
d. Power Servo Assembly
e. LEM Guidance Computer
f. LEM DSKY
g. Computer Control and Reticle Dimmer Assembly
h. "A" Harness Assembly
i. "B" Harness Assembly

2. Record the indications resulting from the following inspections performed on the equipment called out in step 1.

a. Insure that all units have met their respective subassembly requirements by a review of inspection status indications such as tags and stamps.
b. Harness for nicks, scratches, wire abrasions, loose lacing, burs, dents, encapsulant defects, and pin condition.
c. Mating surfaces for cracks and

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC 12600 REV - PAGE 2 OF 2

SUBSYSTEM LEM G & N SYSTEM

ASSY

foreign material.

d. Markings for legibility, appearance and proper registration.
e. Surfaces for scratches, dents, nicks or other obvious defects.
f. All potting material for condition.
g. All plugs and jacks for pin conditions.

G & N SYSTEM TEST TIME

3. Observe and record the following ETI readings indicated on the Power Supply Load Panel:

a. ISS
b. Wheel
c. LGC

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 10

JDC
NO. 12600
REV. -
INITIAL TDRR 25341

JOB LEM G & N SYSTEM VISUAL INSPECTION

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TCTA . ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ ________ CAL DATE

NAME ________ SER. NO. ________ ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	INERTIAL MEASUREMENT UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ________

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 10

TEST HISTORY

DATE START ________ END ________ ________ SYSTEM NO.

TIME START ________ END ________

OPERATOR ________

JDC
NO. 12600
REV. -

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	PULSE TORQUE ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ________

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 10

TEST HISTORY
DATE START ____ END ____ ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12600
REV. -

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	COUPLING DISPLAY UNIT		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 10

TEST HISTORY
DATE START ____ END ____ ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12600
REV. -

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	POWER SERVO ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 10

TEST HISTORY
DATE START ____ END ____ ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12600
REV. -

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	LEM GUIDANCE COMPUTER		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 10

TEST HISTORY
DATE START ____ END ____ ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12600
REV. -

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	VALUE	UNITS
	LEM DSKY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 10

TEST HISTORY
DATE START ______ END ______
TIME START ______ END ______
OPERATOR ______
SYSTEM NO. ______

JDC
NO. 12600
REV. -

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 8 OF 10

TEST HISTORY
DATE START ______ END ______
TIME START ______ END ______
OPERATOR ______
SYSTEM NO. ______

JDC
NO. 12600
REV. -

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	"A" HARNESS ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 9 OF 10

TEST HISTORY
DATE START ______ END ______
TIME START ______ END ______
OPERATOR ______
SYSTEM NO. ______

JDC
NO. 12600
REV. -

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NUMBER	PARAMETER	REJ	ACC
	"B" HARNESS ASSEMBLY		
2.a	Applicable Inspections		
2.b	Harnesses		
2.c	Mating Surfaces		
2.d	Markings		
2.e	Surfaces		
2.f	Potting Material		
2.g	Plugs and Jacks		
	REMARKS:		

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 10 OF 10

JDC
NO. 12600
REV. -

JOB LEM G & N SYSTEM VISUAL INSPECTION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3.a	ISS Elapsed Time Test Start	hrs	▨		▨	▨	▨
	ISS Elapsed Test Complete	hrs	▨		▨	▨	▨
3.b	Wheel Elapsed Time Test Start	hrs	▨		▨	▨	▨
	Wheel Elapsed Time Test Complete	hrs	▨		▨	▨	▨
3.c	AGC Elapsed Time Test Start	hrs	▨		▨	▨	▨
	AGC Elapsed Time Test Complete	hrs	▨		▨	▨	▨

DATE ______

JDC 12601 REV. A PAGE 1 OF 1

JOB LGC INSTALLATION

INITIAL TDRR 25341 D.S. PGS -

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Installation of LGC on the LGC Cold Plate of the Component Mounting Plate.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26930	1	-	WK	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Purge and fill LGC Cold Plate using the filling and Purging Fixture.
2. Install the LGC on the LGC Cold Plate of the Component Mounting Plate.

    NOTE: Insure screws are tightened evenly to provide good contact between the LGC Header and the LGC Cold Plate.

3. Insert mounting screws and tighten to 60-75 inch-pounds. (14 screws 1/4-28 x 1, P/N MS 16996-24 and 28 washers P/N AN960C416L or equivalent.)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JDC 12601 REV. B PAGE 1 OF 1
INITIAL TDRR 25341 D.S. PGS. -

JOB LGC INSTALLATION

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Installation of LGC on the LGC Cold Plate of the Component Mounting Plate.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26930	1	-	WK	-
B	4-14-66	28073	1	-	WK	-

REFERENCES PS 6015000
JDC 18045

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Insure that the LGC Coldplate has been purged and filled. (If purging and filling is required, refer to JDC 18045.)

2. Install the LGC on the LGC Cold Plate of the Component Mounting Plate.

   NOTE: Insure screws are tightened evenly to provide good contact between the LGC Header and the LGC Cold Plate.

3. Insert mounting screws and tighten to 60-75 inch-pounds. (14 screws 1/4-28 x 1, P/N MS 16996-24 and 28 washers, two per screw, P/N AN960C416L or equivalent.)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JDC 12601 REV. C PAGE 1 OF 1
INITIAL TDRR 25341 D.S. PGS -

JOB LGC INSTALLATION

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Installation of LGC on the LGC Cold Plate of the Component Mounting Plate.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	3-8-66	26930	1	-	WK	-
B	4-14-66	28073	1	-	WK	-
C	9-1-66	30937	1	-	JP	

REFERENCES PS 6015000
JDC 18045

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Insure that the LGC Coldplate has been purged and filled. (If purging and filling is required, refer to JDC 18045.)

2. Install the LGC on the LGC Cold Plate of the Component Mounting Plate.

   NOTE: Insure screws are tightened evenly to provide good contact between the LGC Header and the LGC Cold Plate.

3. Insert mounting screws and tighten to 60-75 inch-pounds. (14 screws 1/4-28 x 1, P/N MS 16996-24 and 28 washers, two per screw, P/N AN960C416L or equivalent.)

4. Install in LGC three Fixed Memory Rope Modules and three Fixed Memory Jumper Modules. Tighten screws on six modules to 15-19 in-lbs.

   NOTE: Once these modules have been installed, they should remain in the LGC unless replacement of a module is required.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JOB LGC INSTALLATION	JDC 12601 REV. D PAGE 1 OF 2 INITIAL TDRR 25341 D.S. PGS. -
SUBSYSTEM LEM G & N SYSTEM	ASSY.

DESCRIPTION Installation of LGC on the LGC Cold Plate of the Component Mounting Plate.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-8-66	26930	1	-	WK	-
(M) B	4-14-66	28073	1	-	WK	-
(M) C	9-1-66	30937	1	-	JP	
D	11-25-66	32058	All	-	EA	-

REFERENCES PS 6015000
JDC 18045

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Insure that the LGC Coldplate has been purged and filled. (If purging and filling is required, refer to JDC 18045.)

2. Install the LGC on the LGC Cold Plate of the Component Mounting Plate.

   NOTE: Insure screws are tightened evenly to provide good contact between the LGC Header and the LGC Cold Plate.

3. Insert mounting screws and tighten to 60-75 inch-pounds. (14 screws 1/4-28 x 1, P/N MS 16996-24 and 28 washers, two per screw, P/N AN960C416L or equivalent.)

4. Install three Fixed Memory Rope Modules and one Fixed Memory Jumper Module in LGC as shown in Figure 1. Tighten screws on modules to 15-19 in-lbs.

   NOTE: Once these modules have been installed, they should remain in the LGC unless replacement of a module is required.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

FORM 00143A
Chg. 3-15-66

JOB LGC INSTALLATION	JDC 12601 REV D PAGE 2 OF 2
SUBSYSTEM LEM G & N SYSTEM	ASSY

B1 Fixed Memory Rope Mod.	B2 Fixed Memory Rope Mod.
B3 Fixed Memory Rope Mod.	B4 Fixed Memory Jumper Mod.
B5 Vacant	B6 Vacant

Figure 1.

DATE 18 JAN 66

FORM 00145
Chg. 7-23-65

JOB LGC INSTALLATION

JDC 12601 REV. F PAGE 1 OF 2

INITIAL TDRR 25341 D.S. PGS -

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Installation of LGC on the LGC Cold Plate of the Component Mounting Plate.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26930	1	-	WK	-
B	4-14-66	28073	1	-	WK	-
C	9-1-66	30937	1	-	JP	
D	11-25-66	32058	All	-	EA	-
E	10-12-67	34847	All	-	EA	-
F	1-28-69	37276	2	-	EA	-

REFERENCES PS 6015000
JDC 18045

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Insure that the LGC Coldplate has been purged and filled. (If purging and filling is required, refer to JDC 18045.)

2. Install the LGC on the LGC Cold Plate of the Component Mounting Plate.

NOTE: Insure screws are tightened evenly to provide good contact between the LGC Header and the LGC Cold Plate.

3. Insert mounting screws and tighten to 60-75 inch-pounds. (14 screws 1/4-28 x 1, P/N MS 16996-24 and 28 washers, two per screw, P/N AN960C416L or equivalent.)

4. Install three fixed memory rope modules and either one or three jumper modules in LGC as specified on Drawing 2021101 and as shown on Figure 1. Tighten screws on modules to 15-19 in-lbs.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JOB LGC INSTALLATION

JDC 12601 REV F PAGE 2 OF 2

SUBSYSTEM LEM G & N SYSTEM

ASSY

B1 Fixed Memory Rope Module	B2 Fixed Memory Rope Module
B3 Fixed Memory Rope Module	B4 Jumper Module
B5 Vacant or Jumper Module	B6 Vacant or Jumper Module

NOTE: Jumper Module, P/N 2003076-021, must be used in the B4 position. The B5 and B6 positions may contain jumper modules, P/N 2003076-021 or P/N 2003076-031.

Figure 1.

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INITIAL TDRR 25341 D.S. PGS -

JOB LGC INSTALLATION

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Purge and fill LGC Cold Plate using the filling and Purging Fixture.
2. Install the LGC on the LGC Cold Plate of the Component Mounting Plate.

   NOTE: Insure screws are tightened evenly to provide good contact between the LGC Header and the LGC Cold Plate.
3. Insert mounting screws and tighten to 60-75 inch-pounds. (14 screws 1/4-28 x 1, P/N MS 16996-24 and 28 washers P/N AN960C416L or equivalent.)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

JOB COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY INSTALLATION

JDC 12602 **REV.** A **PAGE** 1 **OF** 1

INITIAL TDRR 25341 **D.S. PGS** -

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Installation of CCRDA on Component Mounting Plate.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26927	1	-	WK	ACM

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Install the Computer Control and Reticle Dimmer Assembly on the Component Mounting Plate.

2. Obtain cable W135 (P/N 6900024). Connect P2 and P3 to P1 and J1 respectively on the Computer Control and Reticle Dimmer Assembly.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JOB COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY INSTALLATION

JDC 12602 **REV.** B **PAGE** 1 **OF** 1

INITIAL TDRR 25341 **D.S. PGS** -

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Installation of CCRDA on Component Mounting Plate.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
Ⓜ A	3-8-66	26927	1	-	WK	ACM
B	12-15-66	32340	1	-	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Install the Computer Control and Reticle Dimmer Assembly on the Component Mounting Plate.

2. Obtain cable W135 (P/N 6900024). Connect P2 and P3 to P1 and J1 respectively on the Computer Control and Reticle Dimmer Assembly.

NOTE: Do not connect W135-P1 to J27 on the GDB at this time.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM 00143
Chg. 7-23-65

JOB COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY INSTALLATION

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INITIAL TDRR 25341 D.S. PGS -

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Install the Computer Control and Reticle Dimmer Assembly on the Component Mounting Plate.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

JOB "A" HARNESS INSTALLATION

JDC 12603 REV. E PAGE 1 OF 2

INITIAL TDRR 25341 D.S. PGS -

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Placement of "A" Harness on Component Mounting Plate and partial connection.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	3-8-66	26931	1	-	WK	-
B	7-21-66	30267	1	-	EA	-
C	8-4-66	30401	1	-	EA	-
D	9-15-66	31052	All	-	EA	-
E	9-26-68	36861	1	-	EA	-

REFERENCES PS 6015000

IMPORTANT. See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT

Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

PROCEDURE

1. Carefully lay the "A" Harness Assembly in position on the Subsystem Mounting Fixture Component Mounting Plate.

> CAUTION: Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage.

2. Visually inspect connectors 56P2, 56P3, 45J19, and 40J53 to insure that pins and sockets are not bent or damaged.

3. Install gasket on PSA connector 45J19. (Gasket FC 757926 or equivalent)

4. Carefully locate harness plug 56P2 on the guide pins of PSA connector 45J19, ease plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

5. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

6. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB "A" HARNESS INSTALLATION

JDC 12603 REV E PAGE 2 OF 2

SUBSYSTEM LEM G & N SYSTEM

ASSY

7. Carefully locate harness plug 56P3 on the guide pins of CDU connector 40J53, ease plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

8. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

9. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

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JDC 12606 **REV.** A **PAGE** 1 **OF** 1

INITIAL TDRR 25341 **D.S. PGS**

JOB "B" HARNESS INSTALLATION

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Installation of "B" Harness and partial connection.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26928	1	-	WK	ACM

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Position the "B" Harness in the PTA/PEA Mounting Fixture on the Rotary Table.
2. Mount TB-2 on the PTA/PEA Mounting Fixture. Tighten the 4 mounting screws finger tight.
3. Connect 56P19 to J19 on the PTA.
4. Connect 56P20 to 35A1J2 on the IMU.

   NOTE: Connector 56P21 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JOB "B" HARNESS INSTALLATION

JDC 12606 REV. B PAGE 1 OF 1

INITIAL TDRR 25341 D.S. PGS 0

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Installation of "B" Harness and partial connection.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26928	1	-	WK	ACM
B	7-21-66	30268	1	-	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

NOTE: If continuing directly from ISS testing, reverse the PTA and PTA coldplate assembly on the PTA/PEA Mounting Fixture. Then proceed to step 1.

1. Position the "B" Harness in the PTA/PEA Mounting Fixture on the Rotary Table.
2. Mount TB-2 on the PTA/PEA Mounting Fixture. Tighten the 4 mounting screws finger tight.
3. Connect 56P19 to J19 on the PTA.
4. Connect 56P20 to 35A1J2 on the IMU.

NOTE: Connector 56P21 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JDC 12606 REV. C PAGE 1 OF 1
INITIAL TDRR 25341 D.S. PGS 0

JOB "B" HARNESS INSTALLATION

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Installation of "B" Harness and partial connection.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26928	1	-	WK	ACM
B	7-21-66	30268	1	-	EA	-
C	8-4-66	30402	1	-	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

NOTE: If continuing directly from ISS testing, reverse the PTA and PTA coldplate assembly on the PTA/PEA Mounting Fixture. Then proceed to step 1.

1. Position the "B" Harness in the PTA/PEA Mounting Fixture on the Rotary Table.
2. Mount TB-2 on the PTA/PEA Mounting Fixture. Tighten the 4 mounting screws finger tight.
3. Connect 56P19 of "B" harness to J19 of PTA using gasket (FC 757924) between connectors 56P19 and J19. Torque to 19 ± 1 in. lb.
4. Connect 56P20 to 35A1J2 on the IMU.

NOTE: Connector 56P21 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JDC 12606 REV. D PAGE 1 OF 2
JOB "B" HARNESS INSTALLATION
INITIAL TDRR 25341 D.S. PGS 0
SUBSYSTEM LEM G & N SYSTEM
ASSY.
DESCRIPTION Installation of "B" Harness and partial connection.

	Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
				JDC	D.S.	MIT	NASA
(M)	A	3-8-66	26928	1	-	WK	ACM
(M)	B	7-21-66	30268	1	-	EA	-
(N)	C	8-4-66	30402	1	-	EA	-
	D	9-15-66	31053	All	-	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

NOTE: If continuing directly from ISS testing, reverse the PTA and PTA coldplate assembly on the PTA/PEA Mounting Fixture. Then proceed to step 1.

1. Position the "B" Harness in the PTA/PEA Mounting Fixture on the Rotary Table.

2. Mount TB-2 on the PTA/PEA Mounting Fixture. Tighten the 4 mounting screws finger tight.

NOTE: Connector 56P21 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

CAUTION: Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB "B" HARNESS INSTALLATION
JDC 12606 REV D PAGE 2 OF 2
SUBSYSTEM LEM G & N SYSTEM
ASSY

3. Visually inspect connectors 56P19, J19 on PTA, 56P20, and 35A1J2 on IMU to insure that pins and sockets are not bent or damaged.

4. Install gasket on J19 of PTA. (Gasket FC 757924 or equivalent)

5. Carefully locate harness plug 56P19 on the guide pins of the PTA connector J19, ease plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

6. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

7. On the sides of the harness plug, tighten the two captive screws and torque to 19±1 in-lbs.

8. Carefully connect harness plug 56P20 to IMU connector 35A1J2.

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JOB "B" HARNESS INSTALLATION | JDC 12606 REV. F PAGE 1 OF 3
INITIAL TDRR 25341 D.S. PGS 0

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Installation of "B" Harness and partial connection.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26928	1	-	WK	ACM
B	7-21-66	30268	1	-	EA	-
C	8-4-66	30402	1	-	EA	-
D	9-15-66	31053	All	-	EA	-
E	3-22-68	35904	2	-	EA	-
F	9-26-68	36861	1	-	EA	-

REFERENCES PS 6015000

IMPORTANT
See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT

Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

PROCEDURE

NOTE: If continuing directly from ISS testing, reverse the PTA and PTA coldplate assembly on the PTA/PEA Mounting Fixture. Then proceed to step 1.

1. Position the "B" Harness in the PTA/PEA Mounting Fixture on the Rotary Table.

2. Mount TB-2 on the PTA/PEA Mounting Fixture. Tighten the 4 mounting screws finger tight.

NOTE: Connector 56P21 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

CAUTION: Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB "B" HARNESS INSTALLATION | JDC 12606 REV F PAGE 2 OF 3

SUBSYSTEM LEM G & N SYSTEM | ASSY

NOTE: When mating a microdot connector plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines, and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position when the connectors are fully mated. Check locking action by exerting a light pull on the connector. When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector).

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may cause connector damage.

6. Insert the finger part of

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JOB "B" HARNESS INSTALLATION | JDC 12606 REV F PAGE 3 OF 3

SUBSYSTEM LEM G & N SYSTEM | ASSY

special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

3. Visually inspect connectors 56P19, J19 on PTA, 56P20, and 35A1J2 on IMU to insure that pins and sockets are not bent or damaged.

4. Install gasket on J19 of PTA. (Gasket FC 757924 or equivalent)

5. Carefully locate harness plug 56P19 on the guide pins of the PTA connector J19, ease plug onto the connector maintaining parallelism between plug and connector as closely as possible, and engage the four corner jackscrews until finger tight.

6. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19 ± 1 in-lbs.

7. On the side of the harness plug, tighten the two captive screws and torque to 19 ± 1 in-lbs.

8. Carefully connect harness plug 56P20 to IMU connector 35A1J2.

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JDC 12606 REV. - PAGE 1 OF 1

JOB "B" HARNESS INSTALLATION

INITIAL TDRR 25341 D.S. PGS

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Position the "B" Harness in the PTA/PEA Mounting Fixture on the Rotary Table.
2. Secure the Main Wire Trunk to the Main Wire Trunk bracket.
3. Mount TB-2 on the PTA/PEA Mounting Fixture. Tighten the 4 mounting screws finger tight.
4. Connect 56P19 to J19 on the PTA.
5. Connect 56P20 to 35A1J2 on the IMU.

   NOTE: Connector 56P21 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

[illegible]

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV. A PAGE 1 OF 7

INITIAL TDRR 27134 D.S. PGS 2

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Collect, assemble and prepare GSE for LEM G & N System testing including GSE to GSE cabling.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-6-66	28589	3,5,6,7	-	MM	ACM

REFERENCES PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled and installed with extreme care since it contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. The proper installation procedure and sequence is required to prevent possible damage or degradation of G & N system and components.

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. All tools shall be in proper operating condition.

4. A thorough visual examination of all equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment as well as to cable bundles, harnesses and connectors.

B. PREPARATIONS

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

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SUBSYSTEM LEM G & N SYSTEM

ASSY

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power cable W137 is disconnected.

C. PROCEDURES

1. Place Prime Power Circuit breaker located on the back of the OIA console to OFF.

2. Insure that cables W120, W132, W134, W141 and W135 are attached to the Boom.

3. Insure that the cables listed in Table 1 are connected. (Exceptions noted). (See Figure 1.)

The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

JDC NO.	JOB
18000	Applying Inertial Signals via the Primary Signal Selector Panel
18001	Applying Reference Signals to the Dual Beam Oscilloscope via the Primary Signal Selector Panel
18003	Applying Auxiliary Signals via the Primary Signal Selector Panel
18005	Voltage Measurement - Dual Beam Oscilloscope
18006	Phase Shift Measurements - Dual Beam Oscilloscope
18007	Time Measurements - Dual Beam Oscilloscope
18008	Frequency Measurements - Dual Beam Oscilloscope
18009	Lower Beam (B Scope, Channel 1) Pulse Monitoring - Dual Beam Oscilloscope
18010	Lower Beam (B Scope) Channel 1 and 2 Monitoring - Dual Beam Oscilloscope
18011	Applying Oscillograph Signals to the Dual Beam Oscilloscope
18012	DC Balance Calibration of Signal Generator
18013	Operation of the Signal Generator
18016	Voltage Measurement with the Current Source Monitor and Galvanometer Voltmeter or JDC 00160, Pulse Torque Electronics Test
18017	Count Function - Counter
18018	E/ UT XN Function - Counter
18019	Ratio Function - Counter
18020	Period Function - Counter

DATE 15 MAR 66

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV A PAGE 3 OF 7

SUBSYSTEM LEM G & N SYSTEM

ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

JDC NO.	JOB
18021	Test N_1 Function - Counter
18022	Test N_2 Function - Counter
18023	Operation of Oscillograph Console (Electric)
18024	Operation of Oscillograph Console (Ink)
18025	Calibration of DC Amplifier - Oscillograph
18026	Operation of DC Amplifiers - Oscillograph
18032	Ink Cartridge Installation - Oscillograph
18033	Pen Installation - Oscillograph
18034	Change Paper - Oscillograph
18035	DC Voltage Measurement - Digital Voltmeter
18036	AC Voltage Measurement - Digital Voltmeter
18037	Automatic Measurement of an AC or DC Voltage - Digital Voltmeter
18038	Measurement of a Total RMS Voltage - Phase Angle Voltmeter
18039	Measurement of a Fundamental RMS Component - Phase Angle Voltmeter
18040	Measurement of a Phase Angle - Phase Angle Voltmeter
18041	Measurement of In-Phase and Quadrature Components - Phase Angle Voltmeter
18042	Indication of a Phase Sensitive Null - Phase Angle Voltmeter
18043	Operation of the Digital Recorder
18044	Gimbal Position Control Panel Operation and Calibration (Inertial Subsystem Test Only.)
18045	Operation of Purging and Filling Fixture
18046	G & N Coolant and Power Console Operation and Interconnections
18049	Maintain and Monitor IMU Heat Using ICTC
18103	Applying Auxiliary Signals via the Primary Signal Selector Panel
18104	Applying Signals to the Dual Beam Oscilloscope via the Auxiliary Input Panel
18249	Maintain and Monitor IMU Using Portable Temperature Controller
18260	Performance Verification of the Digital Voltmeter
18261	Performance Verification of the Phase Angle Voltmeter

DATE 15 MAR 66

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV A PAGE 4 OF 7

SUBSYSTEM LEM G & N SYSTEM

ASSY

Table I

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921)*	P2		Wall Power
	A30J5	P1	W85 (1901960)*	P2		Aux Wall Power
	J26	P4	W123 (2900379)	P8	J67	GSE Distribution Box
	J25	P3		P7	J66	
	J24	P2		P6	J63	
	J21	P1		P5	J60	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	

* Cable W26 must be connected before cable W85.

DATE 15 MAR 66

Table I (cont)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (cont)	E80		W127 (2900327)		E1	GSE Distribution Box (cont)
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	E1		W127 (2900327)		E300	Rotary Table
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall Power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
Current Source Monitor Panel	J4	P1	W65 (1900739)*	P2	J15	TPA-1
Facility Ground			W37 (1901662)		E300	Rotary Table
G and N Fixture Cradle	E2		W66 (1901677)		E1	G and N Fixture Base
G and N Fixture Base	E1	P1	W64 (1901676)	P2	E300	Rotary Table
Rotary Table	E300		W128 (2900458)		E2	GSE Distribution Box
Rotary Table	E300		W128 (2900458) **		E1	System Mounting Fixture
GSE Distribution Box	E3		W129 (2900459) **		E1	System Mounting Fixture
TPA-1	J2	P5	W132 (2900497)	P10	J18	GSE Distribution Box
		P4		P9	J14	
TPA-2	J3	P3	W136 (2900461)	P1	J24	GSE Distribution Box
	J4	P4		P2	J28	
PTA/ PEA Mounting Fixture		P2	W132 (2900497)	P7	J216	System Mounting Fixture
		P3		P8	J223	
		P1	W134 (2900588)	P2	J215	
		P2	W120 (2900456)	P1	J19	OIA

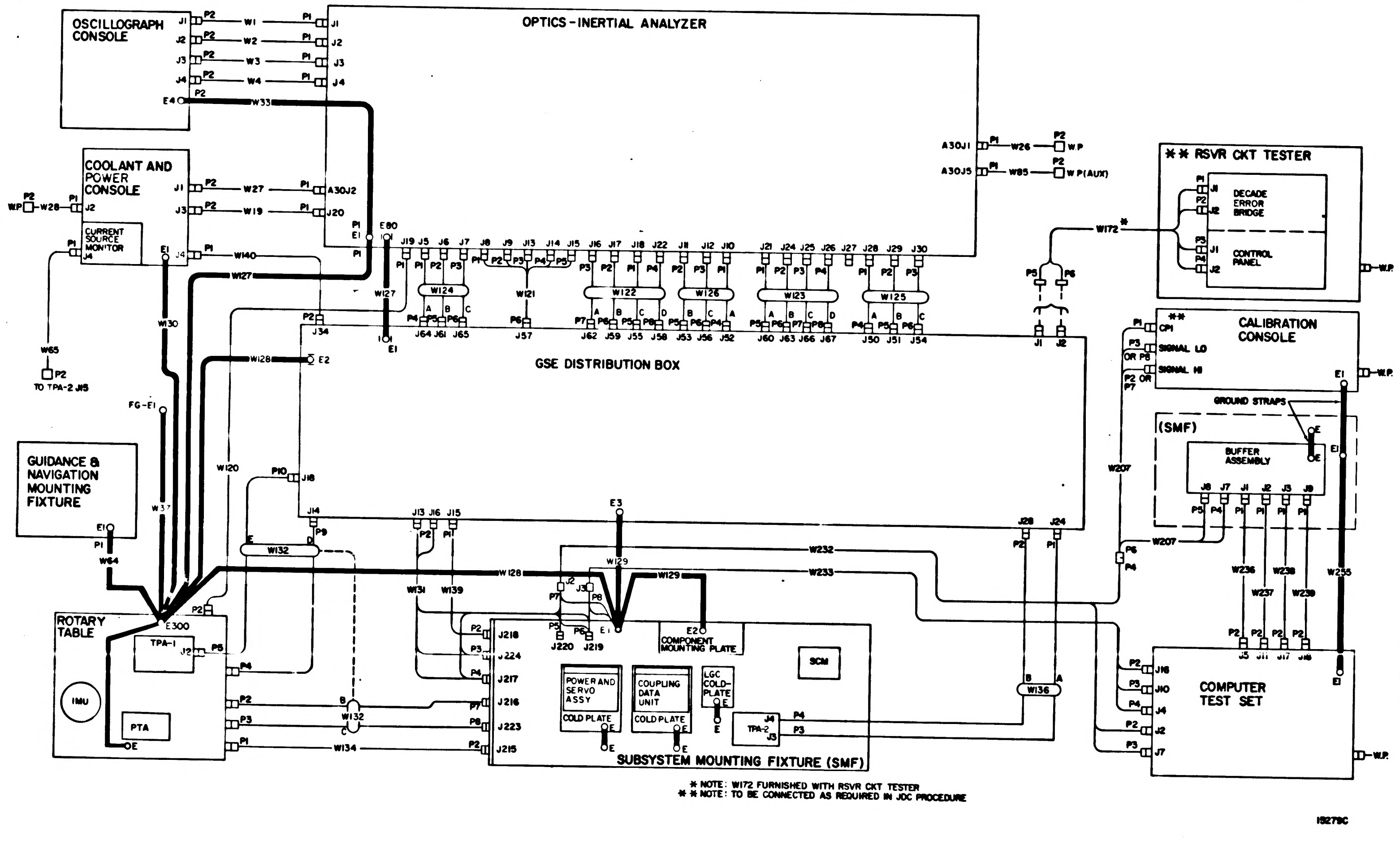
* Do not connect W65 J15 to TPA-1
** Universal Test Station Only

Table I (cont)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
GSE Distribution Box	E1		W129 (2900459)		E2	Component Mounting Plate
	J15	P10		P9	J218	System Mounting Fixture
	J13	P1	W131 (6900023)	P3	J224	
	J16	P2		P4	J217	
				P5	J220	
				P6	J219	
					E1	
LGC Buffer Assembly	J1	P1	W236 (2014463-011)	P2	J5	Computer Test Set
	J2	P1	W237 (2014462-011)	P2	J11	
	J3	P1	W238 (2014462-021)	P2	J17	
	J9	P1	W239 (2014462-031)	P2	J18	
	J8	P5	W207 (1020253)	P6	P4	W232
	J7	P4				
W139	P7	J2	W232 (2014483-011)	P3	J7	Computer Test Set
				P2	J2	
	P8	J3	W233 (2014484-011)	J16	P2	
				J10	P3	
				J4	P4	
PTA/PEA Coldplate	E1		W68 (1902284)		E300	Rotary Table
			Connect all coldplates to Ground			

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING	JDC 12607 REV A PAGE 7 OF 7
SUBSYSTEM LEM G & N SYSTEM	ASSY


OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
✱✱ RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
CALIBRATION CONSOLE
SIGNAL LO
SIGNAL HI
GSE DISTRIBUTION BOX
GUIDANCE & NAVIGATION MOUNTING FIXTURE
ROTARY TABLE
IMU
TPA-1
PTA
E300
GROUND STRAPS
(SMF)
BUFFER ASSEMBLY
COMPONENT MOUNTING PLATE
POWER AND SERVO ASSY
COLD PLATE
COUPLING DATA UNIT
COLD PLATE
LGC COLD-PLATE
SCM
TPA-2
SUBSYSTEM MOUNTING FIXTURE (SMF)
COMPUTER TEST SET
W.P.
TO TPA-2 J15
W124
W121
W122
W126
W123
W125
W132
W136
W172 ✱
W207
W236
W237
W238
W239
W235
W232
W233
W128
W129
W131
W139
W134
W120
W130
W127
W140
W33
W64
W65
W26
W85
W27
W19
W28
W1
W2
W3
W4

✱ NOTE: W172 FURNISHED WITH RSVR CKT TESTER

✱✱ NOTE: TO BE CONNECTED AS REQUIRED IN JDC PROCEDURE

19279C

Figure 1. GSE-GSE Interconnect

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12607
REV. A
INITIAL TDRR -

JOB PREPARE GSE FOR LEM G & N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ____	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ ____ CAL DATE
NAME ____ SER. NO. ____ ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER B.1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing as per applicable PS 6015000 or ND 1021042 for field-site testing.)	Tester's Initials

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

TEST HISTORY
DATE START ____ END ____ ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12607
REV. A

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC ITEM NUMBER B.2 CALIBRATION OF TEST EQUIPMENT: Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.	REJECTED	ACCEPTED

REMARKS:

DATE 15 MAR 66

JOB	PREPARE GSE FOR LEM G & N SYSTEM TESTING	JDC 12607 REV. B PAGE 1 OF 7	INITIAL TDRR 27134 D.S. PGS 2
SUBSYSTEM	LEM G & N SYSTEM	ASSY.	

DESCRIPTION Collect, assemble and prepare GSE for LEM G & N System testing including GSE to GSE cabling.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-6-66	28589	3, 5, 6, 7	-	MM	ACM
B	6-16-66	29678	5, 6, 7	-	MM	-

REFERENCES PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled and installed with extreme care since it contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. The proper installation procedure and sequence is required to prevent possible damage or degradation of G & N system and components.

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. All tools shall be in proper operating condition.

4. A thorough visual examination of all equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment as well as to cable bundles, harnesses and connectors.

B. PREPARATIONS

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

---

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power cable W137 is disconnected.

C. PROCEDURES

1. Place Prime Power Circuit breaker located on the back of the OIA console to OFF.

2. Insure that cables W120, W132, W134, W141 and W135 are attached to the Boom.

3. Insure that the cables listed in Table 1 are connected. (Exceptions noted). (See Figure 1.)

The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

JDC NO.	JOB
18000	Applying Inertial Signals via the Primary Signal Selector Panel
18001	Applying Reference Signals to the Dual Beam Oscilloscope via the Primary Signal Selector Panel
18003	Applying Auxiliary Signals via the Primary Signal Selector Panel
18005	Voltage Measurement - Dual Beam Oscilloscope
18006	Phase Shift Measurements - Dual Beam Oscilloscope
18007	Time Measurements - Dual Beam Oscilloscope
18008	Frequency Measurements - Dual Beam Oscilloscope
18009	Lower Beam (B Scope, Channel 1) Pulse Monitoring - Dual Beam Oscilloscope
18010	Lower Beam (B Scope) Channel 1 and 2 Monitoring - Dual Beam Oscilloscope
18011	Applying Oscillograph Signals to the Dual Beam Oscilloscope
18012	DC Balance Calibration of Signal Generator
18013	Operation of the Signal Generator
18016	Voltage Measurement with the Current Source Monitor and Galvanometer Voltmeter or JDC 00160, Pulse Torque Electronics Test
18017	Count Function - Counter
18018	E/ UT XN Function - Counter
18019	Ratio Function - Counter
18020	Period Function - Counter

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

JDC NO.	JOB
18021	Test N_1 Function - Counter
18022	Test N_2 Function - Counter
18023	Operation of Oscillograph Console (Electric)
18024	Operation of Oscillograph Console (Ink)
18025	Calibration of DC Amplifier - Oscillograph
18026	Operation of DC Amplifiers - Oscillograph
18032	Ink Cartridge Installation - Oscillograph
18033	Pen Installation - Oscillograph
18034	Change Paper - Oscillograph
18035	DC Voltage Measurement - Digital Voltmeter
18036	AC Voltage Measurement - Digital Voltmeter
18037	Automatic Measurement of an AC or DC Voltage - Digital Voltmeter
18038	Measurement of a Total RMS Voltage - Phase Angle Voltmeter
18039	Measurement of a Fundamental RMS Component - Phase Angle Voltmeter
18040	Measurement of a Phase Angle - Phase Angle Voltmeter
18041	Measurement of In-Phase and Quadrature Components - Phase Angle Voltmeter
18042	Indication of a Phase Sensitive Null - Phase Angle Voltmeter
18043	Operation of the Digital Recorder
18044	Gimbal Position Control Panel Operation and Calibration (Inertial Subsystem Test Only.)
18045	Operation of Purging and Filling Fixture
18046	G & N Coolant and Power Console Operation and Interconnections
18049	Maintain and Monitor IMU Heat Using ICTC
18103	Applying Auxiliary Signals via the Primary Signal Selector Panel
18104	Applying Signals to the Dual Beam Oscilloscope via the Auxiliary Input Panel
18249	Maintain and Monitor IMU Using Portable Temperature Controller
18260	Performance Verification of the Digital Voltmeter
18261	Performance Verification of the Phase Angle Voltmeter

Table I

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921)*	P2		Wall Power
	A30J5	P1	W85 (1901960)*	P2		Aux Wall Power
	J26	P4	W123 (2900379)	P8	J67	GSE Distribution Box
	J25	P3		P7	J66	
	J24	P2		P6	J63	
	J21	P1		P5	J60	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	

* Cable W26 must be connected before cable W85.

Table I (cont)

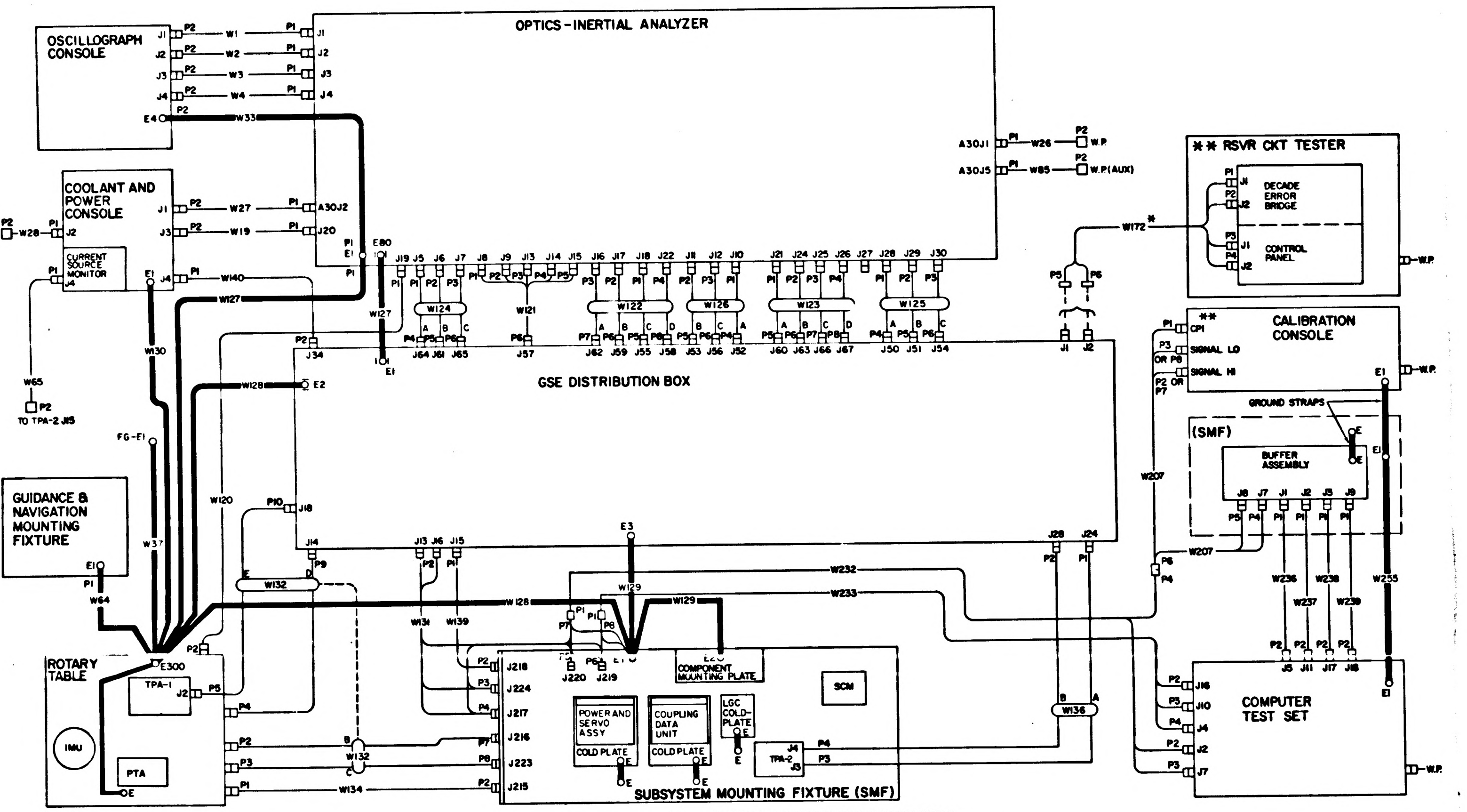
GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (cont)	E80		W127 (2900327)		E1	GSE Distribution Box (cont)
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	E1		W127 (2900327)		E300	Rotary Table
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall Power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
Current Source Monitor Panel	J4	P1	W65 (1900739)*	P2	J15	TPA-1
Facility Ground			W37 (1901662)		E300	Rotary Table
G and N Fixture Cradle	E2		W66 (1901677)		E1	G and N Fixture Base
G and N Fixture Base	E1	P1	W64 (1901676)	P2	E300	Rotary Table
Rotary Table	E300		W128 (2900458)		E2	GSE Distribution Box
Rotary Table	E300		W128 (2900458) **		E1	System Mounting Fixture
GSE Distribution Box	E3		W129 (2900459) **		E1	System Mounting Fixture
TPA-1	J2	P5	W132 (2900497	P10	J18	GSE Distribution
PTA/ PEA Mounting Fixture		P4		P9	J14	Box
		P2		P7		System Mounting Fixture
		P3		P8		
		P1	W134 (2900588)	P2		
		P2	W120 (2900456)	P1	J19	OIA
TPA-2	J3	P3	W136 (2900461)	P1	J24	GSE Distribution Box
	J4	P4		P2	J28	

* Do not connect W65 J15 to TPA-1
** Universal Test Station Only

Table I (cont)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
GSE Distribution Box	E1		W129 (2900459)		E2	Component Mounting Plate
	J15	P10		P9	J218	System Mounting Fixture
	J13	P1	W131 (6900023)	P3	J224	
	J16	P2		P4	J217	
				P5	J220	
				P6	J219	
					E1	
LGC Buffer Assembly	J1	P1	W236 (2014463-011)	P2	J5	Computer Test Set
	J2	P1	W237 (2014462-011)	P2	J11	
	J3	P1	W238 (2014462-021)	P2	J17	
	J9	P1	W239 (2014462-031)	P2	J18	
	J8	P5	W207 (1020253)	P6	P4	W232
	J7	P4				
W131	P7	P1	W232 (2014483-011)	P3	J7	Computer Test Set
				P2	J2	
	P8	P1	W233 (2014484-011)	J16	P2	
				J10	P3	
				J4	P4	
PTA/PEA Coldplate	E1		W68 (1902284)		E300	Rotary Table
			Connect all coldplates to Ground			

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING	JDC 12607 REV B PAGE 7 OF 7
SUBSYSTEM LEM G & N SYSTEM	ASSY


OPTICS-INERTIAL ANALYZER
OSCILLOGRAPH CONSOLE
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
GUIDANCE & NAVIGATION MOUNTING FIXTURE
ROTARY TABLE
TPA-1
PTA
IMU
E300
SUBSYSTEM MOUNTING FIXTURE (SMF)
COMPONENT MOUNTING PLATE
POWER AND SERVO ASSY
COUPLING DATA UNIT
COLD PLATE
LGC COLD-PLATE
TPA-2
SCM
** RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
** CALIBRATION CONSOLE
SIGNAL LO
SIGNAL HI
GROUND STRAPS
(SMF)
BUFFER ASSEMBLY
COMPUTER TEST SET
W.P.
W.P.(AUX)
TO TPA-2 J15
FG-E1
W1
W2
W3
W4
W33
W27
W19
W28
W65
W140
W127
W130
W128
W120
W37
W64
W132
W134
W131
W139
W129
W232
W233
W136
W124
W121
W122
W126
W123
W125
W26
W85
W172 *
W207
W236
W237
W238
W239
W235

* NOTE: W172 FURNISHED WITH RSVR CKT TESTER
** NOTE: TO BE CONNECTED AS REQUIRED IN JDC PROCEDURE

19279 D

Figure 1. GSE-GSE Interconnect

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12607
REV. B
INITIAL TDRR -

JOB PREPARE GSE FOR LEM G & N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST
TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY
DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER B.1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing as per applicable PS 6015000 or ND 1021042 for field-site testing.)	Tester's Initials

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

TEST HISTORY
DATE START ______ END ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12607
REV. B

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC ITEM NUMBER B.2 CALIBRATION OF TEST EQUIPMENT:	REJECTED	ACCEPTED
Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.		

REMARKS:

DATE 15 MAR 66

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING
JDC 12607 REV. C PAGE 1 OF 10
INITIAL TDRR 27134 D.S. PGS 2

SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION Collect, assemble and prepare GSE for LEM G & N System testing including GSE to GSE cabling.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-6-66	28589	3, 5, 6, 7	-	MM	ACM
B	6-16-66	29678	5, 6, 7	-	MM	-
C	10-13-66	31508	2 - 6	-	EA	-

REFERENCES PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled and installed with extreme care since it contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. The proper installation procedure and sequence is required to prevent possible damage or degradation of G & N system and components.

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. All tools shall be in proper operating condition.

4. A thorough visual examination of all equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment as well as to cable bundles, harnesses and connectors.

B. PREPARATIONS

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING
JDC 12607 REV C PAGE 2 OF 10

SUBSYSTEM LEM G & N SYSTEM
ASSY

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power cable W137 is disconnected.

C. PROCEDURES

1. Place Prime Power Circuit breaker located on the back of the OIA console to OFF.

2. Insure that cables W120, W132, W134, W141 and W135 are attached to the Boom.

3. Insure that the cables listed in Table 1 are connected. (Exceptions noted). (See Figure 1.)

The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021

DATE ____________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING
JDC 12607 REV C PAGE 3 OF 10

SUBSYSTEM LEM G & N SYSTEM
ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Counter (cont)	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008

DATE ____________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING
JDC 12607 REV C PAGE 4 OF 10

SUBSYSTEM LEM G & N SYSTEM
ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Dual beam oscilloscope (cont)	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18053
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
Inertial components temperature controller	Provide IMU heat	18049
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028
	Applying signals to dual beam oscilloscope, scope "B," channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034

DATE ____________

Table I (cont)

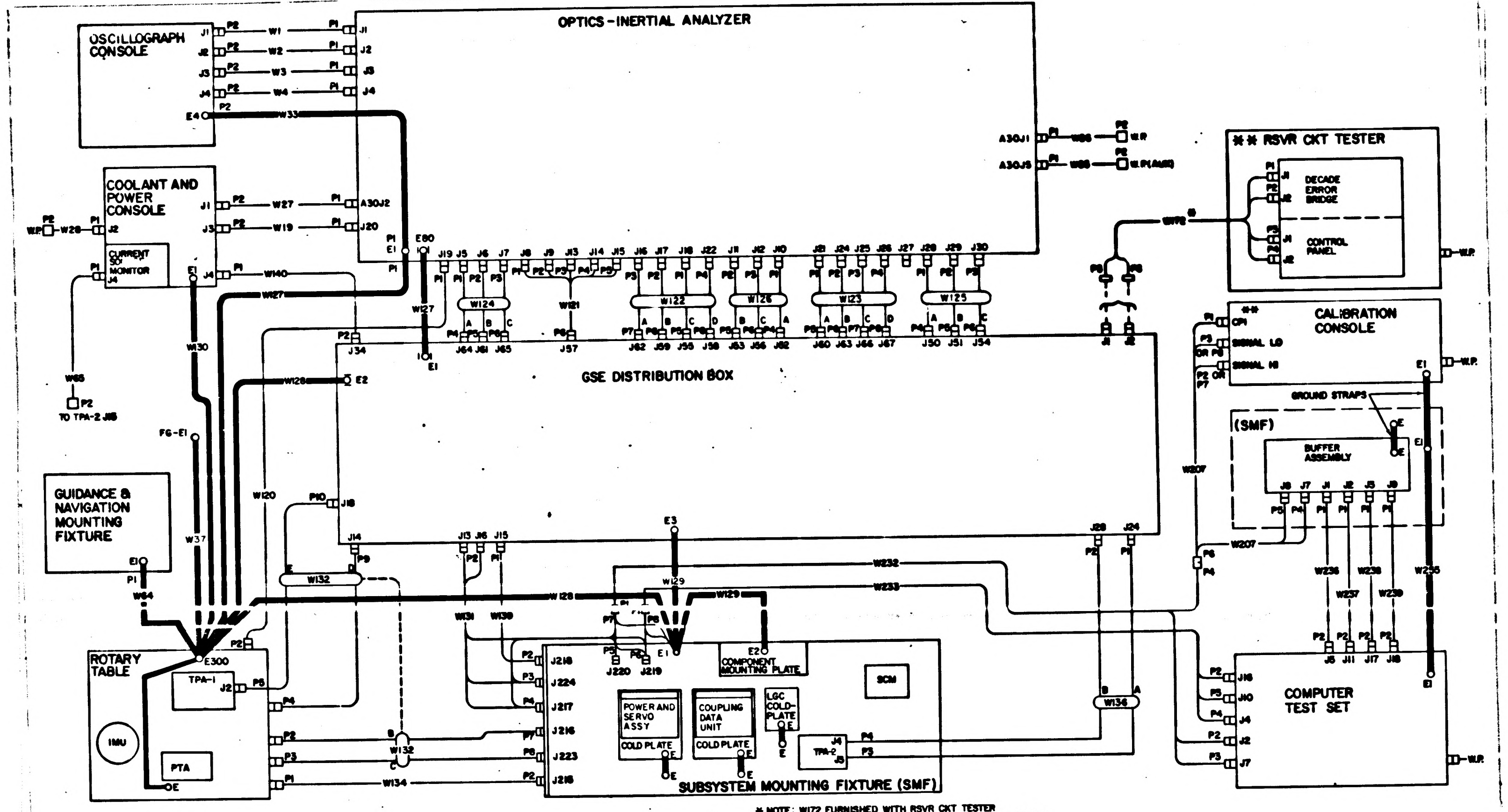
GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
GSE Distribution Box	E1		W129 (2900459)		E2	Component Mounting Plate
	J15	P10		P9	J218	System Mounting Fixture
	J13	P1	W131 (6900023)	P3	J224	
	J16	P2		P4	J217	
				P5	J220	
				P6	J219	
					E1	
LGC Buffer Assembly	J1	P1	W236 (2014463-011)	P2	J5	Computer Test Set
	J2	P1	W237 (2014462-011)	P2	J11	
	J3	P1	W238 (2014462-021)	P2	J17	
	J9	P1	W239 (2014462-031)	P2	J18	
	J8	P5	W207 (1020253)	P6	P4	W232
	J7	P4				
W131	P7	P1	W232 (2014483-011)	P3	J7	Computer Test Set
				P2	J2	
	P8	P1	W233 (2014484-011)	J16	P2	
				J10	P3	
				J4	P4	
PTA/PEA Coldplate	E1		W68 (1902284)		E300	Rotary Table

Connect all coldplates to Ground

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV C PAGE 10 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY


OPTICS-INERTIAL ANALYZER
OSCILLOGRAPH CONSOLE
COOLANT AND POWER CONSOLE
CURRENT SOI MONITOR
GSE DISTRIBUTION BOX
GUIDANCE & NAVIGATION MOUNTING FIXTURE
ROTARY TABLE
IMU
PTA
TPA-1
E300
FG-E1
TO TPA-2 J16
W1
W2
W3
W4
W33
W27
W19
W28
W140
W127
W130
W128
W120
W37
W64
W65
W124
W121
W122
W126
W123
W125
W132
W131
W139
W129
W232
W233
W134
W136
W172
W207
W236
W237
W238
W239
W235
E80
E1
E2
E3
J34
J57
** RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
CALIBRATION CONSOLE
CP1
SIGNAL LO
SIGNAL HI
GROUND STRAPS
(SMF)
BUFFER ASSEMBLY
COMPUTER TEST SET
W.P.
SUBSYSTEM MOUNTING FIXTURE (SMF)
COMPONENT MOUNTING PLATE
SCM
POWER AND SERVO ASSY
COUPLING DATA UNIT
COLD PLATE
LGC COLD-PLATE
TPA-2
J218
J224
J217
J216
J223
J215
J220
J219

* NOTE: W172 FURNISHED WITH RSVR CKT TESTER
** NOTE: TO BE CONNECTED AS REQUIRED IN JDC PROCEDURE

IE2798

Figure 1. GSE-GSE Interconnect

DATE 15 MAR 66

FORM 60115

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12607
REV. C
INITIAL TDRR -

JOB PREPARE GSE FOR LEM G & N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ____	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE ____
NAME ____ SER. NO. ____ CAL DATE ____

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER B.1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing as per applicable PS 6015000 or ND 1021042 for field-site testing.)	Tester's Initials

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

TEST HISTORY
DATE START ____ END ____ ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12607
REV. C

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC ITEM NUMBER B.2 CALIBRATION OF TEST EQUIPMENT: Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.	REJECTED	ACCEPTED

REMARKS:

DATE 15 MAR 66

FORM C0118
Chg. 7-23-65

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING
JDC 12607 REV D PAGE 1 OF 10
INITIAL TDRR 27134 D.S. PGS 2

SUBSYSTEM LEM G & N SYSTEM
ASSY.
DESCRIPTION Collect, assemble and prepare GSE for LEM G & N System testing including GSE to GSE cabling.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-6-66	28589	3, 5, 6, 7	-	MM	ACM
B	6-16-66	29678	5, 6, 7	-	MM	-
C	10-13-66	31508	2 - 6	-	EA	-
D	11-17-66	31962	4, 5, 6	-	EA	-

REFERENCES PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled and installed with extreme care since it contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. The proper installation procedure and sequence is required to prevent possible damage or degradation of G & N system and components.

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. All tools shall be in proper operating condition.

4. A thorough visual examination of all equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment as well as to cable bundles, harnesses and connectors.

B. PREPARATIONS

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING
JDC 12607 REV D PAGE 2 OF 10

SUBSYSTEM LEM G & N SYSTEM
ASSY

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power cable W137 is disconnected.

C. PROCEDURES

1. Place Prime Power Circuit breaker located on the back of the OIA console to OFF.

2. Insure that cables W120, W132, W134, W141 and W135 are attached to the Boom.

3. Insure that the cables listed in Table 1 are connected. (Exceptions noted). (See Figure 1.)

The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
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	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021

DATE

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING
JDC 12607 REV D PAGE 3 OF 10

SUBSYSTEM LEM G & N SYSTEM
ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Counter (cont)	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008

DATE

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING
JDC 12607 REV D PAGE 4 OF 10

SUBSYSTEM LEM G & N SYSTEM
ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Dual beam oscilloscope (cont)	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18053
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028

DATE

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Applying signals to dual beam oscilloscope, scope "B", channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034
	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of chart speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	-Performance verification	19253

DATE ____________

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104
	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

DATE ____________

Table I

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921)*	P2		Wall Power
	A30J5	P1	W85 (1901960)*	P2		Aux Wall Power
	J26	P4	W123 (2900379)	P8	J67	GSE Distribution Box
	J25	P3		P7	J66	
	J24	P2		P6	J63	
	J21	P1		P5	J60	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	

* Cable W26 must be connected before cable W85.

DATE ____________

Table I (cont)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (cont)	E80		W127 (2900327)		E1	GSE Distribution Box (cont)
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	E1		W127 (2900327)		E300	Rotary Table
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall Power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
Current Source Monitor Panel	J4	P1	W65 (1900739)*	P2	J15	TPA-1
Facility Ground			W37 (1901662)		E300	Rotary Table
G and N Fixture Cradle	E2		W66 (1901677)		E1	G and N Fixture Base
G and N Fixture Base	E1	P1	W64 (1901676)	P2	E300	Rotary Table
Rotary Table	E300		W128 (2900458)		E2	GSE Distribution Box
Rotary Table	E300		W128 (2900458) **		E1	System Mounting Fixture
GSE Distribution Box	E3		W129 (2900459) **		E1	System Mounting Fixture
TPA-1	J2	P5	W132 (2900497	P10	J18	GSE Distribution
PTA/ PEA Mounting Fixture		P4		P9	J14	Box
		P2		P7		System Mounting Fixture
		P3		P8		
		P1	W134 (2900588)	P2		
		P2	W120 (2900456)	P1	J19	OIA
TPA-2	J3	P3	W136 (2900461)	P1	J24	GSE Distribution Box
	J4	P4		P2	J28	

* Do not connect W65 J15 to TPA-1
** Universal Test Station Only

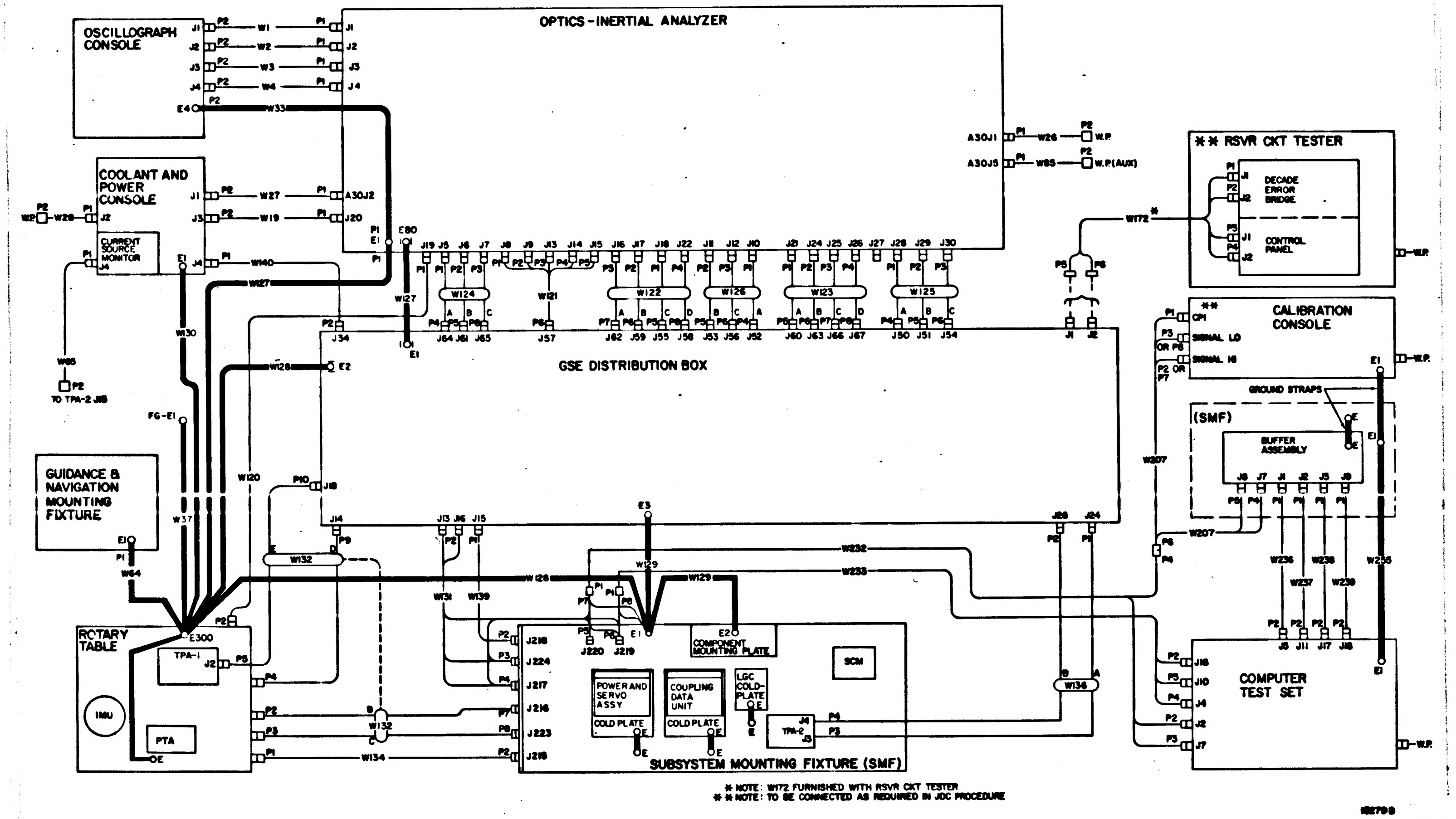
DATE ____________

Table I (cont)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
GSE Distribution Box	E1		W129 (2900459)		E2	Component Mounting Plate
	J15	P10		P9	J218	System Mounting Fixture
	J13	P1	W131 (6900023)	P3	J224	
	J16	P2		P4	J217	
				P5	J220	
				P6	J219	
					E1	
LGC Buffer Assembly	J1	P1	W236 (2014463-011)	P2	J5	Computer Test Set
	J2	P1	W237 (2014462-011)	P2	J11	
	J3	P1	W238 (2014462-021)	P2	J17	
	J9	P1	W239 (2014462-031)	P2	J18	
	J8	P5	W207 (1020253)	P6	P4	W232
	J7	P4				
W131	P7	P1	W232 (2014483-011)	P3	J7	Computer Test Set
				P2	J2	
	P8	P1	W233 (2014484-011)	J16	P2	
				J10	P3	
				J4	P4	
PTA/PEA Coldplate	E1		W68 (1902284)		E300	Rotary Table
		Connect all coldplates to Ground				

DATE ________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING
JDC 12607 REV D PAGE 10 OF 10
SUBSYSTEM LEM G & N SYSTEM
ASSY


OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
W1
W2
W3
W4
W33
W27
W19
W140
W127
W28
W85
TO TPA-2 J16
W26
W.P.
W.P.(AUX)
A30J1
A30J5
A30J2
J20
E80
W124
W121
W122
W126
W123
W125
W130
W128
W120
W37
W64
FG-E1
GSE DISTRIBUTION BOX
GUIDANCE & NAVIGATION MOUNTING FIXTURE
ROTARY TABLE
E300
TPA-1
IMU
PTA
W132
W134
W131
W139
W129
W232
W233
W136
E3
COMPONENT MOUNTING PLATE
SCM
POWER AND SERVO ASSY
COUPLING DATA UNIT
LGC COLD-PLATE
COLD PLATE
TPA-2
SUBSYSTEM MOUNTING FIXTURE (SMF)
** RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
W172 *
** CALIBRATION CONSOLE
SIGNAL LO
SIGNAL HI
GROUND STRAPS
(SMF)
BUFFER ASSEMBLY
W207
W236
W237
W238
W239
W255
COMPUTER TEST SET
1E279D

* NOTE: W172 FURNISHED WITH RSVR CKT TESTER
** NOTE: TO BE CONNECTED AS REQUIRED IN JDC PROCEDURE

Figure 1. GSE-GSE Interconnect

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12607
REV. D
INITIAL TDRR -

JOB PREPARE GSE FOR LEM G & N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ ____ CAL DATE
NAME ____ SER. NO. ____ ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER B.1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing as per applicable PS 6015000 or ND 1021042 for field-site testing.)	Tester's Initials

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

TEST HISTORY
DATE START ____ END ____ ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12607
REV. D

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC ITEM NUMBER B.2 CALIBRATION OF TEST EQUIPMENT:	REJECTED	ACCEPTED
Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.		

REMARKS:

DATE ____

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV. E PAGE 1 OF 10
INITIAL TDRR 27134 D.S. PGS 2

SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION Collect, assemble and prepare GSE for LEM G & N System testing including GSE to GSE cabling.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	5-6-66	28589	3, 5, 6, 7	-	MM	ACM
B	6-16-66	29678	5, 6, 7	-	MM	-
C	10-13-66	31508	2 - 6	-	EA	-
D	11-17-66	31962	4, 5, 6	-	EA	-
E	11-25-66	32059	9, 10	-	EA	-

REFERENCES PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled and installed with extreme care since it contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. The proper installation procedure and sequence is required to prevent possible damage or degradation of G & N system and components.

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. All tools shall be in proper operating condition.

4. A thorough visual examination of all equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment as well as to cable bundles, harnesses and connectors.

B. PREPARATIONS

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV E PAGE 2 OF 10

SUBSYSTEM LEM G & N SYSTEM
ASSY

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power cable W137 is disconnected.

C. PROCEDURES

1. Place Prime Power Circuit breaker located on the back of the OIA console to OFF.

2. Insure that cables W120, W132, W134, W141 and W135 are attached to the Boom.

3. Insure that the cables listed in Table 1 are connected. (Exceptions noted). (See Figure 1.)

The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021

DATE

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV E PAGE 3 OF 10

SUBSYSTEM LEM G & N SYSTEM
ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Counter (cont)	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008

DATE

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV E PAGE 4 OF 10

SUBSYSTEM LEM G & N SYSTEM
ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Dual beam oscilloscope (cont)	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18053
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028

DATE

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Applying signals to dual beam oscilloscope, scope "B", channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034
	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of chart speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	Performance verification	19253

DATE ____________

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104
	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

DATE ____________

Table I

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921)*	P2		Wall Power
	A30J5	P1	W85 (1901960)*	P2		Aux Wall Power
	J26	P4	W123 (2900379)	P8	J67	GSE Distribution Box
	J25	P3		P7	J66	
	J24	P2		P6	J63	
	J21	P1		P5	J60	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	

* Cable W26 must be connected before cable W85.

DATE ____________

Table I (cont)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (cont)	E80		W127 (2900327)		E1	GSE Distribution Box (cont)
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	E1		W127 (2900327)		E300	Rotary Table
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall Power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
Current Source Monitor Panel	J4	P1	W65 (1900739)*	P2	J15	TPA-1
Facility Ground			W37 (1901662)		E300	Rotary Table
G and N Fixture Cradle	E2		W66 (1901677)		E1	G and N Fixture Base
G and N Fixture Base	E1	P1	W64 (1901676)	P2	E300	Rotary Table
Rotary Table	E300		W128 (2900458)		E2	GSE Distribution Box
Rotary Table	E300		W128 (2900458) **		E1	System Mounting Fixture
GSE Distribution Box	E3		W129 (2900459) **		E1	System Mounting Fixture
TPA-1	J2	P5	W132 (2900497	P10	J18	GSE Distribution
PTA/PEA Mounting Fixture		P4		P9	J14	Box
		P2		P7		System Mounting Fixture
		P3		P8		
		P1	W134 (2900588)	P2		
		P2	W120 (2900456)	P1	J19	OIA
TPA-2	J3	P3	W136 (2900461)	P1	J24	GSE Distribution Box
	J4	P4		P2	J28	

* Do not connect W65 J15 to TPA-1
** Universal Test Station Only

DATE ____________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV E PAGE 9 OF 10

SUBSYSTEM LEM G & N SYSTEM

ASSY

Table I (cont)

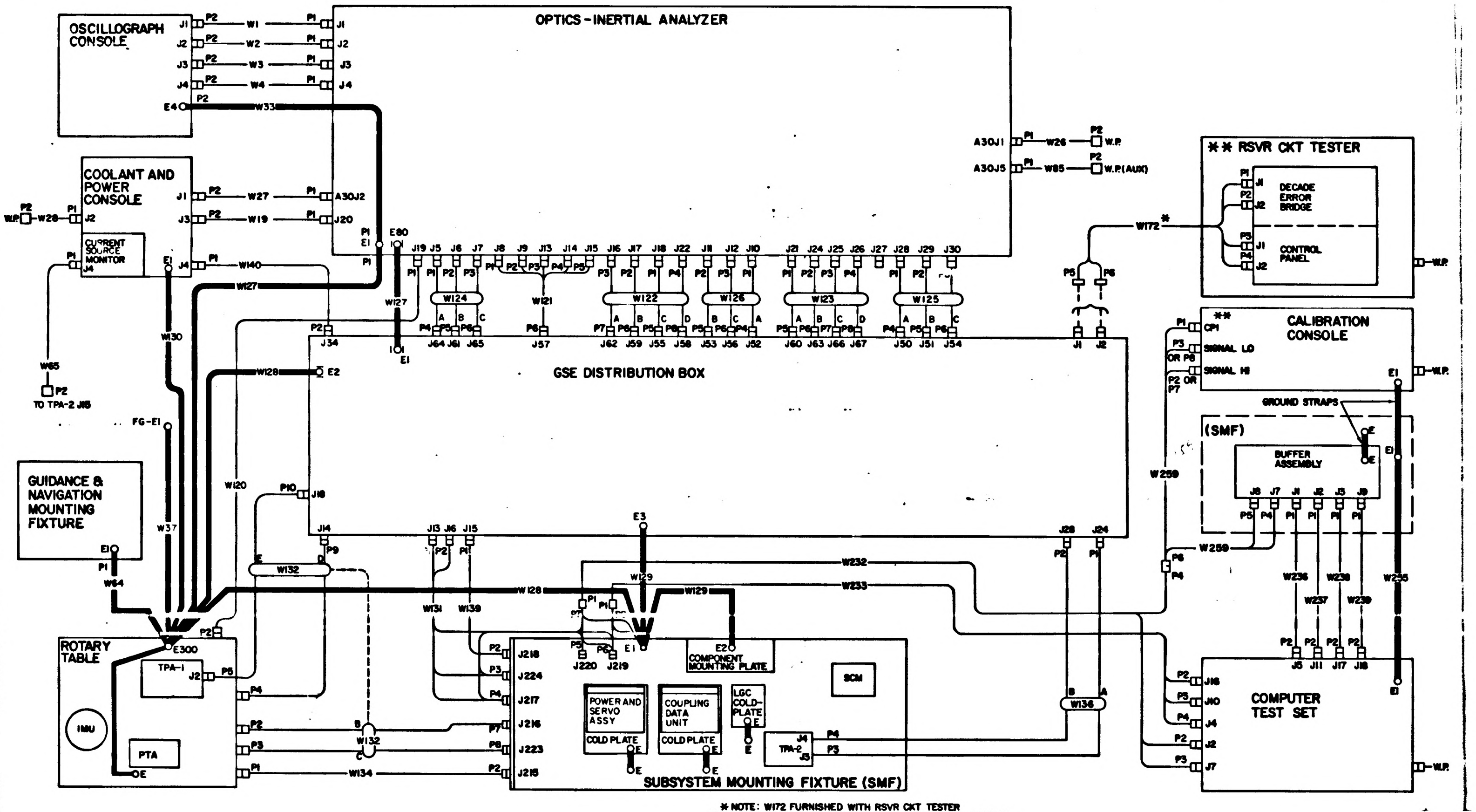
GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
GSE Distribution Box	E1		W129 (2900459)		E2	Component Mounting Plate
	J15	P10		P9	J218	System Mounting Fixture
	J13	P1	W131 (6900023)	P3	J224	
	J16	P2		P4	J217	
				P5	J220	
				P6	J219	
					E1	
LGC Buffer Assembly	J1	P1	W236 (2014463-011)	P2	J5	Computer Test Set
	J2	P1	W237 (2014462-011)	P2	J11	
	J3	P1	W238 (2014462-021)	P2	J17	
	J9	P1	W239 (2014462-031)	P2	J18	
	J8	P5	W259 (2014470-011)	P6	P4	W232
	J7	P4				
W131	P7	P1	W232 (2014483-011)	P3	J7	Computer Test Set
				P2	J2	
	P8	P1	W233 (2014484-011)	J16	P2	
				J10	P3	
				J4	P4	
PTA/PEA Coldplate	E1		W68 (1902284)		E300	Rotary Table
			Connect all coldplates to Ground			

DATE ________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV E PAGE 10 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY


OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
W1
W2
W3
W4
W33
E4
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
W27
W19
A30J2
J20
W28
W.P.
W140
W127
W130
W65
TO TPA-2 J18
FG-E1
W128
W120
W37
W64
GUIDANCE & NAVIGATION MOUNTING FIXTURE
E80
A30J1
A30J5
W26
W85
W.P.(AUX)
W124
W121
W122
W126
W123
W125
GSE DISTRIBUTION BOX
J34
E2
J18
J14
W132
W131
W139
E3
W129
W232
W233
ROTARY TABLE
TPA-1
IMU
PTA
E300
W134
COMPONENT MOUNTING PLATE
SCM
POWER AND SERVO ASSY
COLD PLATE
COUPLING DATA UNIT
COLD PLATE
LGC COLD-PLATE
TPA-2
SUBSYSTEM MOUNTING FIXTURE (SMF)
W136
W172
** RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
** CALIBRATION CONSOLE
CP1
SIGNAL LO
SIGNAL HI
OR P8
P2 OR P7
GROUND STRAPS
(SMF)
BUFFER ASSEMBLY
W259
W258
W236
W237
W238
W239
W245
COMPUTER TEST SET

* NOTE: W172 FURNISHED WITH RSVR CKT TESTER
** NOTE: TO BE CONNECTED AS REQUIRED IN JDC PROCEDURE

15279E

Figure 1. GSE-GSE Interconnect

DATE ____________

FORM 00145
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12607
REV. E
INITIAL TDRR -

JOB PREPARE GSE FOR LEM G & N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST	**TEST HISTORY**
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______
NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER B.1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing as per applicable PS 6015000 or ND 1021042 for field-site testing.)	Tester's Initials

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

TEST HISTORY
DATE START ______ END ______ SYSTEM NO. ______
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12607
REV. E

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC ITEM NUMBER B.2 CALIBRATION OF TEST EQUIPMENT: Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.	REJECTED	ACCEPTED
REMARKS:		

DATE ______

FORM 0-0148
Chg. 7-13-65

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV. F PAGE 1 OF 10
INITIAL TDRR 27134 D.S. PGS 2

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Collect, assemble and prepare GSE for LEM G & N System testing including GSE to GSE cabling.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		
			JDC	D.S.	MIT	NASA	REFERENCES PS 6015000
A	5-6-66	28589	3, 5, 6, 7	-	MM	ACM	
B	6-16-66	29678	5, 6, 7	-	MM	-	
C	10-13-66	31508	2 - 6	-	EA	-	IMPORTANT See below.
D	11-17-66	31962	4, 5, 6	-	EA	-	
E	11-25-66	32059	9, 10	-	EA	-	
F	8-10-67	34339	8, 9, 10	-	EA	-	INTERVAL
							TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled and installed with extreme care since it contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. The proper installation procedure and sequence is required to prevent possible damage or degradation of G & N system and components.

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. All tools shall be in proper operating condition.

4. A thorough visual examination of all equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment as well as to cable bundles, harnesses and connectors.

B. PREPARATIONS

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV F PAGE 2 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power cable W137 is disconnected.

C. PROCEDURES

1. Place Prime Power Circuit breaker located on the back of the OIA console to OFF.

2. Insure that cables W120, W132, W134, W141 and W135 are attached to the Boom.

3. Insure that the cables listed in Table 1 are connected. (Exceptions noted). (See Figure 1.)

The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021

DATE

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV F PAGE 3 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Counter (cont)	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008

DATE

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV F PAGE 4 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Dual beam oscilloscope (cont)	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18053
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028

DATE

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Applying signals to dual beam oscilloscope, scope "B", channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034
	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of chart speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	–Performance verification	19253

DATE ________

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104
	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

DATE ________

Table I

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921)*	P2		Wall Power
	A30J5	P1	W85 (1901960)*	P2		Aux Wall Power
	J26	P4	W123 (2900379)	P8	J67	GSE Distribution Box
	J25	P3		P7	J66	
	J24	P2		P6	J63	
	J21	P1		P5	J60	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	

* Cable W26 must be connected before cable W85.

DATE ________

Table I (cont)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (cont)	E80		W127 (2900327)		E1	GSE Distribution Box (cont)
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	E1		W127 (2900327)		E300	Rotary Table
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall Power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
Current Source Monitor Panel	J4	P1	W65 (1900739)*	P2	J15	TPA-1
Facility Ground			W37 (1901662)		E300	Rotary Table
G and N Fixture Cradle	E2		W66 (1901677)		E1	G and N Fixture Base
G and N Fixture Base	E1	P1	W64 (1901676)	P2	E300	Rotary Table
Rotary Table	E300		W128 (2900458)		E2	GSE Distribution Box
	E300		W128 (2900458) **		E1	System Mounting Fixture
GSE Distribution Box	E3		W129 (2900459) **		E1	
TPA-1	J2	P5	W132 (2900497)	P10	J18	GSE Distribution Box
PTA/PEA Mounting Fixture		P4		P9	J14	
		P2		P7		System Mounting Fixture
		P3		P8		
		P1	W134 (2900588)	P2		
		P2	W120 (2900456)	P1	J19	OIA
TPA-2	J3	P3	W136 (2900461)	P1	J24	GSE Distribution Box
	J4	P4		P2	J28	

* Do not connect W65 J15 to TPA-1
** Universal Test Station Only

DATE ________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV F PAGE 9 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY

Table I (cont)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
System Mounting Fixture	E1		W129 (2900459)		E2	Component Mounting Plate
GSE Distribution Box	J15	P10		P9	J218	System Mounting Fixture
	J13	P1	W131 (6900023)	P3	J224	
	J16	P2		P4	J217	
				P5	J220	
				P6	J219	
					E1	
LGC Buffer Assembly	J1	P1	W236 (2014463-011)	P2	J5	Computer Test Set
	J2	P1	W237 (2014462-011)	P2	J11	
	J3	P1	W238 (2014462-021)	P2	J17	
	J9	P1	W239 (2014462-031)	P2	J18	
	J8	P5	W259 (2014470-011)	P6	P4	W232
	J7	P4				
W131	P7	P1	W232 (2014483-011)	P3	J7	Computer Test Set
				P2	J2	
	P8	P1	W233 (2014484-011)	P2	J16	
				P3	J10	
				P4	J4	
PTA/PEA Coldplate	E1		W68 (1902284)		E300	Rotary Table
			Connect all coldplates to Ground			

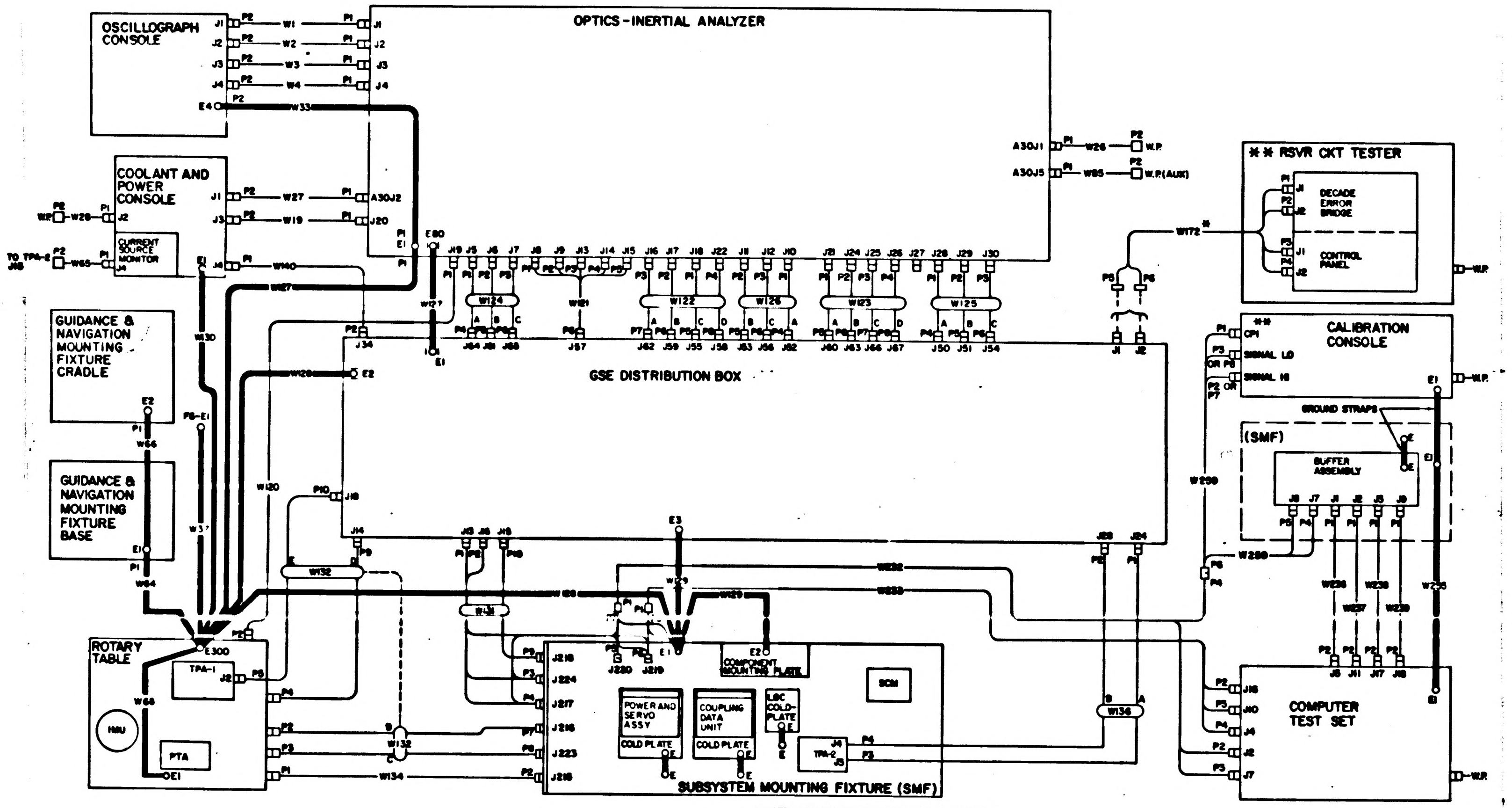
DATE ________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV F PAGE 10 OF 10

SUBSYSTEM LEM G & N SYSTEM

ASSY


OSCILLOGRAPH CONSOLE
OPTICS - INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
TO TPA-2 J16
W.P.
GUIDANCE & NAVIGATION MOUNTING FIXTURE CRADLE
GUIDANCE & NAVIGATION MOUNTING FIXTURE BASE
GSE DISTRIBUTION BOX
ROTARY TABLE
TPA-1
IMU
PTA
E300
** RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
W172 *
** CALIBRATION CONSOLE
CP1
SIGNAL LO
SIGNAL HI
GROUND STRAPS
(SMF)
BUFFER ASSEMBLY
COMPUTER TEST SET
SUBSYSTEM MOUNTING FIXTURE (SMF)
POWER AND SERVO ASSY
COUPLING DATA UNIT
LGC COLD-PLATE
COLD PLATE
COMPONENT MOUNTING PLATE
SCM
TPA-2
W1
W2
W3
W4
W33
W27
W19
W28
W65
W140
W127
W30
W126
W120
W37
W66
W64
W68
W132
W134
W128
W129
W124
W121
W122
W123
W125
W26
W85
W136
W230
W236
W237
W238
W239
W235
A30J1
A30J2
A30J5
J20
J34
J18
J14
J216
J224
J217
J218
J223
J215
J220
J219
W.P.(AUX)

* NOTE: W172 FURNISHED WITH RSVR CKT TESTER
* * NOTE: TO BE CONNECTED AS REQUIRED IN JDC PROCEDURE

15279E

Figure 1. GSE-GSE Interconnect

DATE ________

FORM 00145
(Chg. 7-22-65)

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12607
REV. F
INITIAL TDRR -

JOB PREPARE GSE FOR LEM G & N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER B.1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing as per applicable PS 6015000 or ND 1021042 for field-site testing.)	Tester's Initials

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

TEST HISTORY
DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12607
REV. F

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC ITEM NUMBER B.2 CALIBRATION OF TEST EQUIPMENT:	REJECTED	ACCEPTED
Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.		

REMARKS:

DATE ______

PREPARE GSE FOR LEM G & N **JOB** SYSTEM TESTING	**JDC** 12607 **REV.** G **PAGE** 1 **OF** 10 **INITIAL TDRR** 27134 **D.S. PGS** 2
SUBSYSTEM LEM G & N SYSTEM	**ASSY.**

DESCRIPTION Collect, assemble and prepare GSE for LEM G & N System testing including GSE to GSE cabling.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		
			JDC	D.S.	MIT	NASA	
A	5-6-66	28589	3, 5, 6, 7	-	MM	ACM	**REFERENCES** PS 6015000
B	6-16-66	29678	5, 6, 7	-	MM	-	
C	10-13-66	31508	2 - 6	-	EA	-	**IMPORTANT** See below.
D	11-17-66	31962	4, 5, 6	-	EA	-	
E	11-25-66	32059	9, 10	-	EA	-	
F	8-10-67	34339	8, 9, 10	-	EA	-	**INTERVAL**
G	9-14-67	34609	2	-	EA	-	
							TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled and installed with extreme care since it contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. The proper installation procedure and sequence is required to prevent possible damage or degradation of G & N system and components.

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. All tools shall be in proper operating condition.

4. A thorough visual examination of all equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment as well as to cable bundles, harnesses and connectors.

B. PREPARATIONS

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

PREPARE GSE FOR LEM G & N **JOB** SYSTEM TESTING	**JDC** 12607 **REV** G **PAGE** 2 **OF** 10
SUBSYSTEM LEM G & N SYSTEM	**ASSY**

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power cable W137 is disconnected.

C. PROCEDURES

1. Place Prime Power Circuit breaker located on the back of the OIA console to OFF.

2. Insure that cables W120, W132, W134 and W141 are attached to the Boom.

3. Insure that the cables listed in Table 1 are connected. (Exceptions noted). (See Figure 1.)

The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

Equipment Nomenclature	JDC Description	JDC Number
Auxiliary input panel	Applying auxiliary signals to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying PSA test point adapter and PTA/PEA test point adapter signals to dual beam oscilloscope	18204
	Applying PSA test point adapter signals to dual beam oscilloscope	18104
	Operation - general	18050
Counter	Applying auxiliary signals	18103
	Count clock frequency pulses that occur during interval determined by "D" input events	18020
	Count number of input events that occur during any preselected time interval	18018
	Count number of input events that occur during interval determined by "D" input events	18019
	Determine correct operation of N_1 switches, time base circuitry, and count-chain circuitry	18021

DATE

PREPARE GSE FOR LEM G & N **JOB** SYSTEM TESTING	**JDC** 12607 **REV** G **PAGE** 3 **OF** 10
SUBSYSTEM LEM G & N SYSTEM	**ASSY**

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Counter (cont)	Determine correct operation of N_2 switch	18022
	Forward or reverse count	18017
	Performance verification	19261
Current source monitor panel	Measure voltages	18216
Digital recorder	Operation and interpretation of data	18043
Digital voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Automatic measurement of ac or dc voltage	18037
	Measurement of ac voltage	18236
	Measurement of dc voltage	18235
	Performance verification	19260
Dual beam oscilloscope	Adjustment	19362
	Adjustment of scope A upper beam vertical plug-in unit	19360
	Adjustment of scope B lower beam vertical plug-in unit	19361
	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying oscillograph signals to scope "B," channel 2	18011
	Applying PSA test point adapter and PTA/PEA test point adapter signals	18204
	Applying PSA test point adapter signals	18002
	Applying PSA test point adapter signals	18104
	Applying PTA/PEA test point adapter signals	18202
	Applying reference signals	18001
	Applying two signals simultaneously to scope "B"	18010
	Frequency measurements	18008

DATE

PREPARE GSE FOR LEM G & N **JOB** SYSTEM TESTING	**JDC** 12607 **REV** G **PAGE** 4 **OF** 10
SUBSYSTEM LEM G & N SYSTEM	**ASSY**

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Dual beam oscilloscope (cont)	Performance verification	19263
	Phase shift measurements using upper beam differential amplifier	18006
	Pulse monitoring using scope "B," channel 1	18009
	Time measurements	18007
	Voltage measurements using upper beam differential amplifier	18005
Electrical adapter cable assembly set	Signal monitoring and continuity testing	18053
Fill and purge fixture	Fill and purge G and N system components	18045
Galvanometer	Measure voltages	18216
G and N coolant and power console	Operation and interconnections for G and N system, ISS, and OSS testing	18046
Gimbal position control panel	Operation - general	18244
GSE power supplies	Performance verification	19259
Gyro caging electronics panel	Performance verification	19256
IMU shipping container	Dial and maximum-minimum thermometers comparative checkout	19822
Inertial components temperature controller	Provide IMU heat	18049
Monitor panel	Performance verification	19252
Oscillograph	Adjustment of dc amplifiers	19363
	Adjustment of phase sensitive demodulators	19364
	Adjustment of phase sensitive demodulators (800 cps reference)	18027
	Adjustment of phase sensitive demodulators (3200 cps reference)	18028

DATE

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV G PAGE 5 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Oscillograph (cont)	Applying signals to dual beam oscilloscope, scope "B", channel 2	18011
	Electric writing	18023
	Ink writing	18024
	Installation of ink cartridge	18032
	Installation of ink pen	18033
	Installation of paper	18034
	Operation of dc amplifiers	18026
	Operation of phase sensitive demodulators	18031
	Performance verification of dc amplifiers	19264
	Performance verification of phase sensitive demodulators	19265
	Performance verification of phase sensitive demodulators	19268
	Verification of chart speed	19251
Oscillograph signal selector panel	Performance verification	19254
Phase angle voltmeter	Applying auxiliary signals	18103
	Applying internal signals	18000
	Applying PSA test point adapter signals	18002
	Applying PTA/PEA test point adapter signals	18202
	Indication of phase sensitive null	18042
	Measurement of fundamental rms voltages	18039
	Measurement of in-phase and quadrature components	18041
	Measurement of phase angle	18040
	Measurement of total rms voltage	18038
	Performance verification	19262
	Performance verification	19266
Power supply and load panel	Performance verification	19253

DATE ____________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV G PAGE 6 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

Equipment Nomenclature	JDC Description	JDC Number
Primary signal selector panel	Applying auxiliary signals through auxiliary input panel to digital voltmeter, phase angle voltmeter, dual beam oscilloscope, and counter	18103
	Applying internal signals to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18000
	Applying PSA test point adapter and PTA/PEA test point adapter signals through auxiliary input panel to dual beam oscilloscope	18204
	Applying PSA test point adapter test point signals through auxiliary input panel to dual beam oscilloscope	18104
	Applying PSA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18002
	Applying PTA/PEA test point adapter signals to dual beam oscilloscope, phase angle voltmeter, and digital voltmeter	18202
	Applying reference signals to dual beam oscilloscope	18001
	Performance verification	19257
	Voltage measurement on dual beam oscilloscope of signals through primary signal selector panel	18005
PSA test point adapter	Applying signals through primary signal selector panel to digital voltmeter, phase angle voltmeter, and dual beam oscilloscope	18002
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope	18104
	Applying signals via auxiliary input panel and primary signal selector panel to dual beam oscilloscope (PSA test point adapter and PTA/PEA test point adapter)	18204
Signal generator	Adjustment	18012
	Operation	18013
Temperature indicator	Performance verification	19255
Temperature monitor control panel, II/LEM	Performance verification	19258

DATE ____________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV G PAGE 7 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY

Table I

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921)*	P2		Wall Power
	A30J5	P1	W85 (1901960)*	P2		Aux Wall Power
	J26	P4	W123 (2900379)	P8	J67	GSE Distribution Box
	J25	P3		P7	J66	
	J24	P2		P6	J63	
	J21	P1		P5	J60	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	

* Cable W26 must be connected before cable W85.

DATE ____________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV G PAGE 8 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY

Table I (cont)

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (cont)	E80		W127 (2900327)		E1	GSE Distribution Box (cont)
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	E1		W127 (2900327)		E300	Rotary Table
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall Power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
Current Source Monitor Panel	J4	P1	W65 (1900739)*	P2	J15	TPA-1
Facility Ground			W37 (1901662)		E300	Rotary Table
G and N Fixture Cradle	E2		W66 (1901677)		E1	G and N Fixture Base
G and N Fixture Base	E1	P1	W64 (1901676)	P2	E300	Rotary Table
Rotary Table	E300		W128 (2900458)		E2	GSE Distribution Box
	E300		W128 (2900458) **		E1	System Mounting Fixture
GSE Distribution Box	E3		W129 (2900459) **		E1	
TPA-1	J2	P5	W132 (2900497)	P10	J18	GSE Distribution Box
PTA/PEA Mounting Fixture		P4		P9	J14	
		P2		P7		System Mounting Fixture
		P3		P8		
		P1	W134 (2900588)	P2		
		P2	W120 (2900456)	P1	J19	OIA
TPA-2	J3	P3	W136 (2900461)	P1	J24	GSE Distribution Box
	J4	P4		P2	J28	

* Do not connect W65 J15 to TPA-1
** Universal Test Station Only

DATE ____________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV G PAGE 9 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY

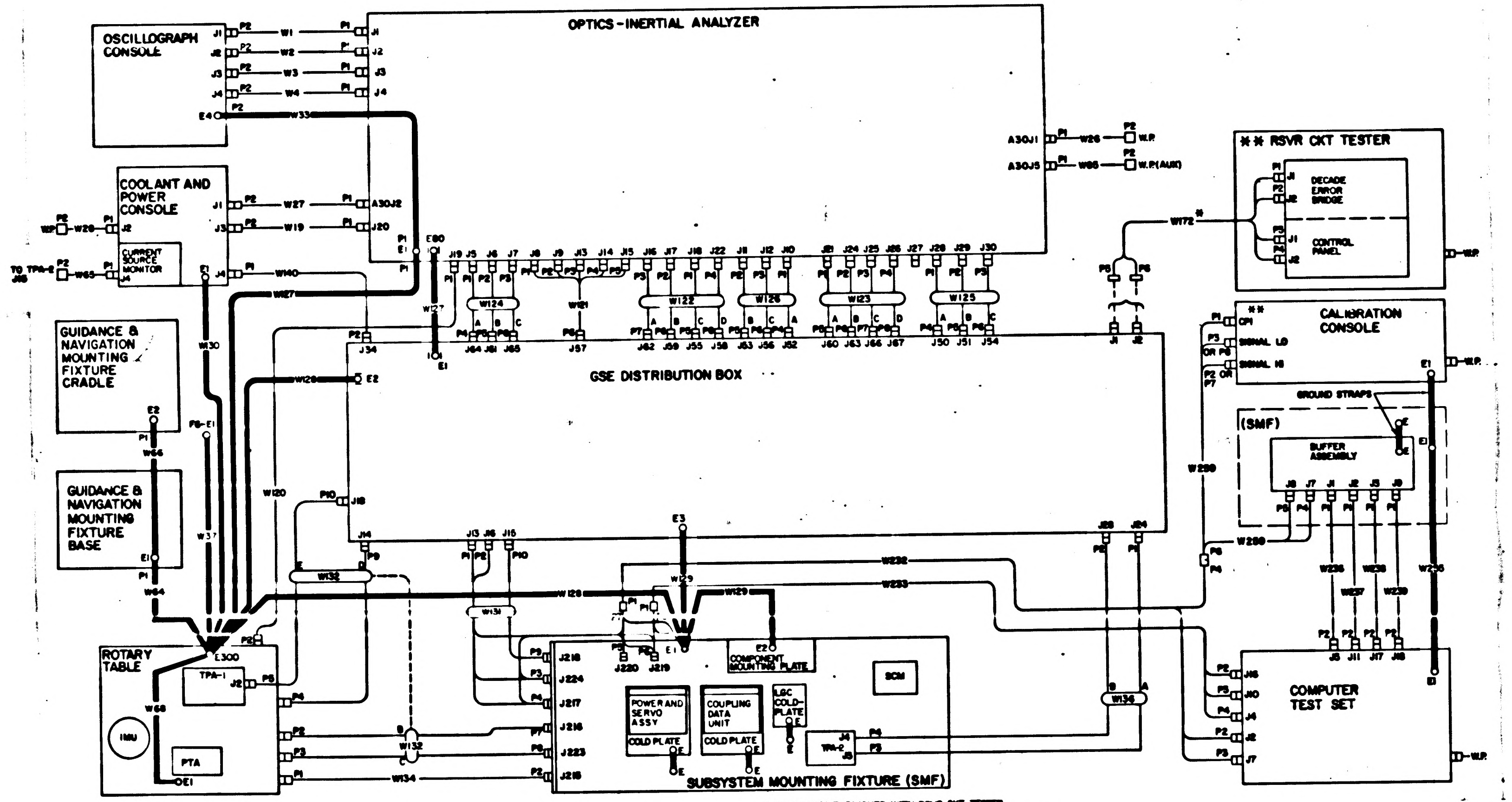
Table I (cont)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
System Mounting Fixture	E1		W129 (2900459)		E2	Component Mounting Plate
GSE Distribution Box	J15	P10	W131 (6900023)	P9	J218	System Mounting Fixture
	J13	P1		P3	J224	
	J16	P2		P4	J217	
				P5	J220	
				P6	J219	
					E1	
LGC Buffer Assembly	J1	P1	W236 (2014463-011)	P2	J5	Computer Test Set
	J2	P1	W237 (2014462-011)	P2	J11	
	J3	P1	W238 (2014462-021)	P2	J17	
	J9	P1	W239 (2014462-031)	P2	J18	
	J8	P5	W259 (2014470-011)	P6	P4	W232
	J7	P4				
W131	P7	P1	W232 (2014483-011)	P3	J7	Computer Test Set
				P2	J2	
	P8	P1	W233 (2014484-011)	P2	J16	
				P3	J10	
				P4	J4	
PTA/PEA Coldplate	E1		W68 (1902284)		E300	Rotary Table
			Connect all coldplates to Ground			

DATE ________

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING | JDC 12607 REV G PAGE 10 OF 10

SUBSYSTEM LEM G & N SYSTEM | ASSY



OPTICS - INERTIAL ANALYZER
OSCILLOGRAPH CONSOLE
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GUIDANCE & NAVIGATION MOUNTING FIXTURE CRADLE
GUIDANCE & NAVIGATION MOUNTING FIXTURE BASE
ROTARY TABLE
TPA-1
IMU
PTA
E300
GSE DISTRIBUTION BOX
* * RSVR CKT TESTER
DECADE ERROR BRIDGE
CONTROL PANEL
* * CALIBRATION CONSOLE
SIGNAL LO
SIGNAL HI
GROUND STRAPS
(SMF)
BUFFER ASSEMBLY
COMPUTER TEST SET
COMPONENT MOUNTING PLATE
SCM
POWER AND SERVO ASSY
COLD PLATE
COUPLING DATA UNIT
COLD PLATE
LGC COLD-PLATE
TPA-2
SUBSYSTEM MOUNTING FIXTURE (SMF)
W.P.
W.P.(AUX)

* NOTE: W172 FURNISHED WITH RSVR CKT TESTER
* * NOTE: TO BE CONNECTED AS REQUIRED IN JDC PROCEDURE

IS279E

Figure 1. GSE-GSE Interconnect

DATE ________

FORM 00145
[illegible]

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12607
REV. G -
INITIAL TDRR -

JOB PREPARE GSE FOR LEM G & N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST

TITLE ______
SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION
TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE
NAME ______ SER. NO. ______ CAL DATE

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NUMBER B.1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing as per applicable PS 6015000 or ND 1021042 for field-site testing.)	Tester's Initials

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

TEST HISTORY

DATE START ______ END ______ ______ SYSTEM NO.
TIME START ______ END ______
OPERATOR ______

JDC
NO. 12607
REV. G

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC ITEM NUMBER B.2 CALIBRATION OF TEST EQUIPMENT: Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.	REJECTED	ACCEPTED

REMARKS:

DATE ______

FORM [illegible]
CHG. 7-23-65

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV. - PAGE 1 OF 7

INITIAL TDRR ______ D.S. PGS 2

TDRR 27134 MAR 15 1966

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Collect, assemble and prepare GSE for LEM G & N System testing including GSE to GSE cabling.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled and installed with extreme care since it contains delicate, sensitive instruments and has critical mounting surfaces and vulnerable connector pins and sockets. The proper installation procedure and sequence is required to prevent possible damage or degradation of G & N system and components.

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

3. All tools shall be in proper operating condition.

4. A thorough visual examination of all equipment shall be performed to detect possible physical damage and to check for sharp edges and abrasion points which could be hazardous to personnel installing G & N equipment as well as to cable bundles, harnesses and connectors.

B. PREPARATIONS

1. Insure that all JDC's necessary to perform the desired testing are available. Record on data sheet.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV - PAGE 2 OF 7

SUBSYSTEM LEM G & N SYSTEM

ASSY

2. Insure that all items of test equipment have been calibrated and adjusted in accordance with the applicable Quality Assurance Implementation Plan. Record on data sheet.

3. Insure that G & N System power cable W137 is disconnected.

C. PROCEDURES

1. Place Prime Power Circuit breaker located on the back of the OIA console to OFF.

2. Insure that cables W120, W132, W134, W141 and W135 are attached to the Boom.

3. Insure that the cables listed in Table 1 are connected. (Exceptions noted). (See Figure 1.)

The following JDC's are to be used if operating procedures for GSE Commercial test equipment are required during use of all JDC's necessary to perform the desired testing.

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS

JDC NO.	JOB
18000	Applying Inertial Signals via the Primary Signal Selector Panel
18001	Applying Reference Signals to the Dual Beam Oscilloscope via the Primary Signal Selector Panel
18003	Applying Auxiliary Signals via the Primary Signal Selector Panel
18005	Voltage Measurement - Dual Beam Oscilloscope
18006	Phase Shift Measurements - Dual Beam Oscilloscope
18007	Time Measurements - Dual Beam Oscilloscope
18008	Frequency Measurements - Dual Beam Oscilloscope
18009	Lower Beam (B Scope, Channel 1) Pulse Monitoring - Dual Beam Oscilloscope
18010	Lower Beam (B Scope) Channel 1 and 2 Monitoring - Dual Beam Oscilloscope
18011	Applying Oscillograph Signals to the Dual Beam Oscilloscope
18012	DC Balance Calibration of Signal Generator
18013	Operation of the Signal Generator
18016	Voltage Measurement with the Current Source Monitor and Galvanometer Voltmeter or JDC 00160, Pulse Torque Electronics Test
18017	Count Function - Counter
18018	E/UT XN Function - Counter
18019	Ratio Function - Counter
18020	Period Function - Counter

DATE ______

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV - PAGE 3 OF 7

SUBSYSTEM LEM G & N SYSTEM

ASSY

INDEX FOR COMMERCIAL EQUIPMENT JDC OPERATING INSTRUCTIONS (cont)

JDC NO.	JOB
18021	Test N_1 Function - Counter
18022	Test N_2 Function - Counter
18023	Operation of Oscillograph Console (Electric)
18024	Operation of Oscillograph Console (Ink)
18025	Calibration of DC Amplifier - Oscillograph
18026	Operation of DC Amplifiers - Oscillograph
18032	Ink Cartridge Installation - Oscillograph
18033	Pen Installation - Oscillograph
18034	Change Paper - Oscillograph
18035	DC Voltage Measurement - Digital Voltmeter
18036	AC Voltage Measurement - Digital Voltmeter
18037	Automatic Measurement of an AC or DC Voltage - Digital Voltmeter
18038	Measurement of a Total RMS Voltage - Phase Angle Voltmeter
18039	Measurement of a Fundamental RMS Component - Phase Angle Voltmeter
18040	Measurement of a Phase Angle - Phase Angle Voltmeter
18041	Measurement of In-Phase and Quadrature Components - Phase Angle Voltmeter
18042	Indication of a Phase Sensitive Null - Phase Angle Voltmeter
18043	Operation of the Digital Recorder
18044	Gimbal Position Control Panel Operation and Calibration (Inertial Subsystem Test Only.)
18045	Operation of Purging and Filling Fixture
18046	G & N Coolant and Power Console Operation and Interconnections

DATE ______

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC 12607 REV - PAGE 4 OF 7

SUBSYSTEM LEM G & N SYSTEM

ASSY

Table I

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA	J1	P1	W1 (1900886)	P2	J1	Osc. Console
	J2	P1	W2 (1900669)	P2	J2	
	J3	P1	W3 (1900670)	P2	J3	
	J4	P1	W4 (1900671)	P2	J4	
	E1	P1	W33 (1901404)	P2	E4	
	J20	P1	W19 (1900873)	P2	J3	Coolant and Power Console
	A30J2	P1	W27 (1900871)	P2	J1	
	A30J1	P1	W26 (1900921)*	P2		Wall Power
	A30J5	P1	W85 (1901960)*	P2		Aux Wall Power
	J26	P4	W123 (2900379)	P8	J67	GSE Distribution Box
	J25	P3		P7	J66	
	J24	P2		P6	J63	
	J21	P1		P5	J60	
	J11	P2	W126 (2900381)	P5	J53	
	J12	P3		P6	J56	
	J10	P1		P4	J52	
	J28	P1	W125 (2900186)	P4	J50	
	J29	P2		P5	J51	
	J30	P3		P6	J54	
	J8	P1	W121 (2900257)	P6	J57	
	J9	P2				
	J13	P3				
	J14	P4				
	J15	P5				
	J5	P1	W124 (2900380)	P4	J64	
	J6	P2		P5	J61	
	J7	P3		P6	J65	

* Cable W26 must be connected before cable W85.

DATE ______

Table I (cont)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
OIA (cont)	E80		W127 (2900327)		E1	GSE Distribution Box (cont)
	J16	P3	W122 (2900378)	P7	J62	
	J17	P2		P6	J59	
	J18	P1		P5	J55	
	J22	P4		P8	J58	
	E1		W127 (2900327)		E300	Rotary Table
Coolant and Power Console	J2	P1	W28 (1900872)	P2		Wall Power
	J4	P1	W140 (2900457)	P2	J34	GSE Distribution Box
	E1		W130 (2900460)		E300	Rotary Table
Current Source Monitor Panel	J4	P1	W65 (1900739)*	P2	J15	TPA-1
Facility Ground			W37 (1901662)		E300	Rotary Table
G and N Fixture Cradle	E2		W66 (1901677)		E1	G and N Fixture Base
G and N Fixture Base	E1		W64 (1901676)		E300	Rotary Table
Rotary Table	E300		W128 (2900458)		E2	GSE Distribution Box
Rotary Table	E300		W128 (2900458) **		E1	System Mounting Fixture
GSE Distribution Box	E3		W129 (2900459) **		E1	System Mounting Fixture
TPA-1	J2	P5	W132 (2900497)	P10	J18	GSE Distribution Box
		P4		P9	J14	
TPA-2	J3	P3	W136 (2900461)	P1	J24	GSE Distribution Box
	J4	P4		P2	J28	
PTA/PEA Mounting Fixture		P2	W132 (2900497)	P7		System Mounting Fixture
		P3		P8		
		P1	W134 (2900588)	P2		
		P2	W120 (2900456)	P1	J19	OIA

* Do not connect W65 J15 to TPA-1
** Universal Test Station Only

DATE ____________

Table I (cont)

GSE-GSE Interconnections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
GSE Distribution Box	E1		W129 (2900459)		E2	Component Mounting Plate
	J15	P10		P9		System Mounting Fixture
	J13	P1	W131 (6900023)	P3		
	J16	P2		P4		
				P5		
				P6		
					E1	
LGC Buffer Assembly	J1	P1	W236 (2014463-011)	P2	J5	Computer Test Set
	J2	P1	W237 (2014462-011)	P2	J11	
	J3	P1	W238 (2014462-021)	P2	J17	
	J9	P1	W239 (2014462-031)	P2	J18	
	J8	P5	W207 (1020253)	P6	P4	W232
	J7	P4				
W139	P7	J2	W232 (2014483-011)	P3	J7	Computer Test Set
				P2	J2	
	P8	J3	W233 (2014484-011)	J16	P2	
				J10	P3	
				J4	P4	
			Connect all coldplates to Ground			

DATE ____________

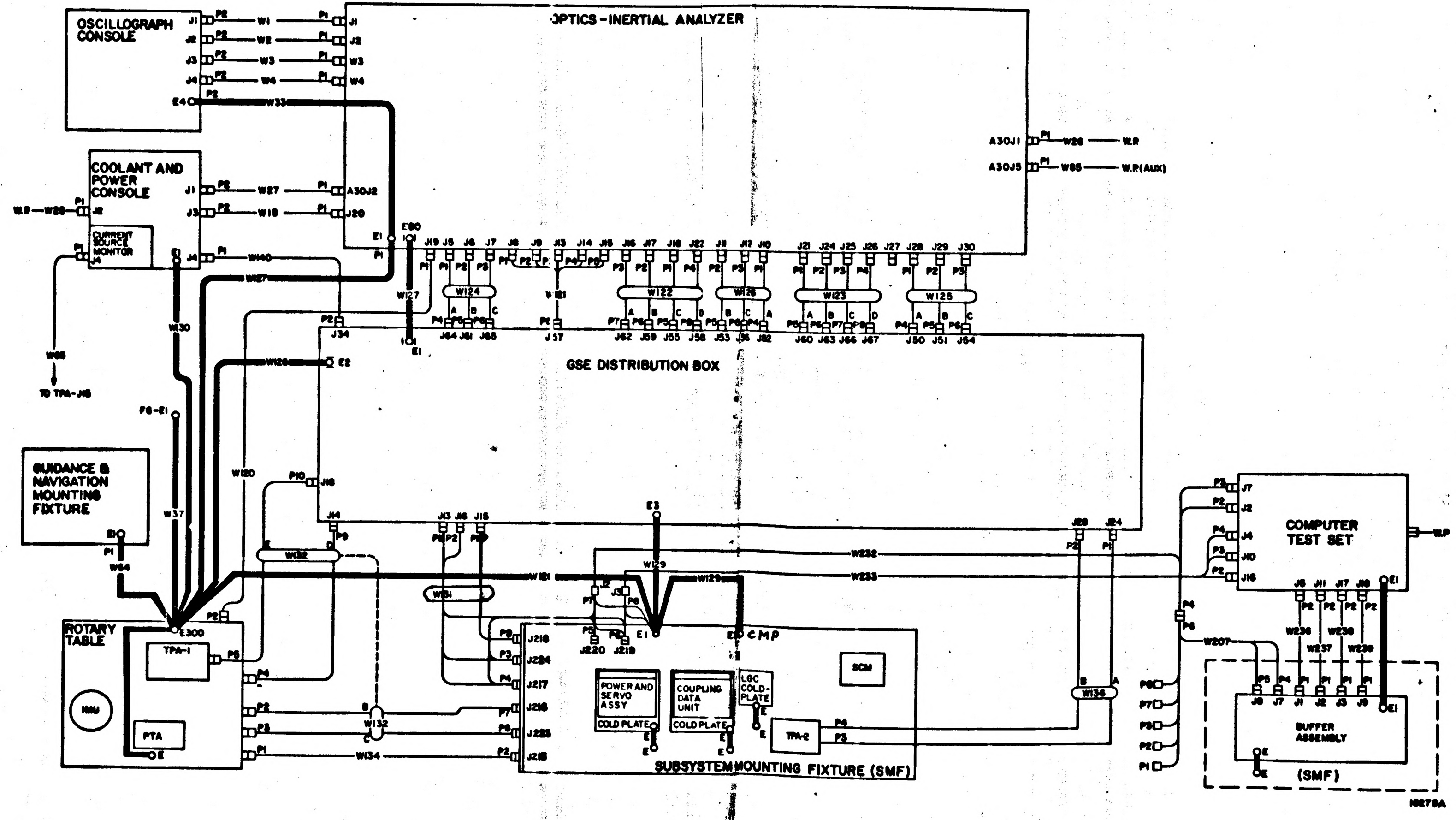

OSCILLOGRAPH CONSOLE
OPTICS-INERTIAL ANALYZER
COOLANT AND POWER CONSOLE
CURRENT SOURCE MONITOR
GSE DISTRIBUTION BOX
GUIDANCE & NAVIGATION MOUNTING FIXTURE
ROTARY TABLE
TPA-1
PTA
IMU
SUBSYSTEM MOUNTING FIXTURE (SMF)
POWER AND SERVO ASSY
COLD PLATE
COUPLING DATA UNIT
COLD PLATE
LGC COLD-PLATE
SCM
TPA-2
COMPUTER TEST SET
BUFFER ASSEMBLY
(SMF)
W1
W2
W3
W4
W33
W27
W19
W28
W26
W85
W.P
W.P(AUX)
W140
W127
W130
W37
W64
W120
W128
W129
W124
W121
W122
W126
W123
W125
W132
W131
W134
W232
W233
W136
W207
W236
W237
W238
W239
TO TPA-J15
E300
CMP
10679A

Figure 1. GSE-GSE Interconnect

DATE ____________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

[illegible] 27134

JDC
NO. 12607
REV. -
INITIAL TDRR -

MAR 1 [illegible]

JOB PREPARE GSE FOR LEM G & N SYSTEM ACCEPTANCE TESTING

ASSEMBLY UNDER TEST

TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NUMBER B.1 NECESSARY JDC's (list JDC's with Revision letter necessary to complete testing as per applicable PS 6015000 or ND 1021042 for field-site testing.)	Tester's Initials

DATE ____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

TEST HISTORY
DATE START ____ END ____
TIME START ____ END ____ SYSTEM NO.
OPERATOR ____

JDC
NO. 12607
REV. -

JOB PREPARE GSE FOR LEM G & N SYSTEM TESTING

JDC ITEM NUMBER B.2 CALIBRATION OF TEST EQUIPMENT:	REJECTED	ACCEPTED
Indicate acceptance or rejection of test equipment calibration as per applicable Quality Assurance Implementation Plan.		

REMARKS:

DATE ____

JOB LEM G & N SYSTEM PASSIVE TEST

JDC 12608 REV. A PAGE 1 OF 2

INITIAL TDRR 25341 D.S. PGS 1

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Connect appropriate cables and check for continuity and ground isolation.

REV. LTR.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3/16/66	27209		1	WK	TM

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

Wheatstone Bridge or equivalent

PROCEDURE

1. Connect GSE Cable W137-P2 to 56P8 and W135 to 50P1. Do not connect to GSE Distribution Box.

2. Insure that; W138, W142, W120, W136, W139, W131, W226 and W132 are not connected.

3. Using a wheatstone bridge, measure the resistance between following pins:

	GRD SYSTEM	FROM (+)	GRD SYSTEM	TO (-)
a.	0 VDC IMU	W137-P1-B	0 VDC CDU	W137-P1-M
b.	0 VDC IMU	W137-P1-B	0 VDC LGC	W137-P1-L
c.	0 VDC LGC	W137-P1-L	0 VDC CDU	W137-P1-M
d.	0 VDC Optics Heater	W135-P1-K	115V 400 cps Optics Low	W135-P1-N
e.	0 VDC IMU	W137-P1-B	SMF	E1
f.	0 VDC CDU	W137-P1-M	SMF	E1
g.	0 VDC LGC	W137-P1-L	SMF	E1
h.	0 VDC Optics Heater	W135-P1-K	SMF	E1
i.	115V 400 cps Optics Low	W135-P1-N	SMF	E1

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB LEM G & N SYSTEM PASSIVE TEST

JDC 12608 REV A PAGE 2 OF 2

SUBSYSTEM LEM G & N SYSTEM

ASSY

4. Using a wheatstone bridge, measure the resistance between point E2 and Facility Ground with 56P3 and 56P4 connected to CDU and LGC respectively.

5. Using a wheatstone bridge, measure the resistance between the following pins:

	FROM (+)	TO (-)
a.	W137-P1-A	W137-P1-B
b.	W137-P1-H	W137-P1-B
c.	W137-P1-K	W137-P1-L
d.	W135-P1-J	W135-P1-K
e.	W135-P1-L	W135-P1-N

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12608
REV. A
INITIAL TDRR 25341

JOB LEM G & N SYSTEM PASSIVE TEST

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE ________

NAME ________ SER. NO. ________ CAL DATE ________

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	RECORDED VALUES 2nd*	RECORDED VALUES 3rd*	MAX VALUE	REJ	ACC
3.a	Resistance	ohms	200				infinity		
3.b	Resistance	ohms	200				infinity		
3.c	Resistance	ohms	200				infinity		
3.d	Resistance	ohms	100				infinity		
3.e	Resistance	ohms	100				infinity		
3.f	Resistance	ohms	100				infinity		
3.g	Resistance	ohms	100				infinity		
3.h	Resistance	mego	1				infinity		
3.i	Resistance	mego	1				infinity		
4	Resistance	ohms	0				0.5		
5.2	Resistance	ohms	2.2				▨		
5.b	Resistance	ohms	11.0				▨		
5.c	Resistance	ohms	6.5				▨		
5.d	Resistance	ohms	11.0				▨		
5.e	Resistance	ohms	5.0				25.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE ________

JOB LEM G & N SYSTEM PASSIVE TEST

JDC 12608 **REV.** B **PAGE** 1 **OF** 2
INITIAL TDRR 25341 **D.S. PGS** 1

SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION Connect appropriate cables and check for continuity and ground isolation.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES
			JDC	D.S.	MIT	NASA	
A	3-16-66	27209		1	WK	TM	
B	4-26-66	28334	1	-	WK	ACM	
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL Wheatstone Bridge or equivalent

PROCEDURE

1. Connect GSE Cable W137-P2 to 56P8 and W135 to 50P1. Do not connect to GSE Distribution Box.

2. Insure that; W138, W143, W120, W136, W131, W226 and W132 are not connected.

3. Using a wheatstone bridge, measure the resistance between following pins:

	GRD SYSTEM	FROM (+)	GRD SYSTEM	TO (-)
a.	0 VDC IMU	W137-P1-B	0 VDC CDU	W137-P1-M
b.	0 VDC IMU	W137-P1-B	0 VDC LGC	W137-P1-L
c.	0 VDC LGC	W137-P1-L	0 VDC CDU	W137-P1-M
d.	0 VDC Optics Heater	W135-P1-K	115V 400 cps Optics Low	W135-P1-N
e.	0 VDC IMU	W137-P1-B	SMF	E1
f.	0 VDC CDU	W137-P1-M	SMF	E1
g.	0 VDC LGC	W137-P1-L	SMF	E1
h.	0 VDC Optics Heater	W135-P1-K	SMF	E1
i.	115V 400 cps Optics Low	W135-P1-N	SMF	E1

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB LEM G & N SYSTEM PASSIVE TEST
JDC 12608 **REV** B **PAGE** 2 **OF** 2

SUBSYSTEM LEM G & N SYSTEM
ASSY

4. Using a wheatstone bridge, measure the resistance between point E2 and Facility Ground with 56P3 and 56P4 connected to CDU and LGC respectively.

5. Using a wheatstone bridge, measure the resistance between the following pins:

	FROM (+)	TO (-)
a.	W137-P1-A	W137-P1-B
b.	W137-P1-H	W137-P1-B
c.	W137-P1-K	W137-P1-L
d.	W135-P1-J	W135-P1-K
e.	W135-P1-L	W135-P1-N

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 **OF** 1

JDC
NO. 12608
REV. B
INITIAL TDRR 25341

JOB LEM G & N SYSTEM PASSIVE TEST

ASSEMBLY UNDER TEST

TITLE ________
SER. NO. ________ DWG ________ REV. ____

TEST HISTORY

DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ____ CAL DATE
NAME ________ SER. NO. ____ CAL DATE

CONDUCTED BY ________ (NAME/AFFILIATION) APPROVED BY ________ (NAME/AFFILIATION)

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.a	Resistance	ohms	200				infinity		
3.b	Resistance	ohms	200				infinity		
3.c	Resistance	ohms	200				infinity		
3.d	Resistance	ohms	100				infinity		
3.e	Resistance	ohms	100				infinity		
3.f	Resistance	ohms	100				infinity		
3.g	Resistance	ohms	100				infinity		
3.h	Resistance	mego	1				infinity		
3.i	Resistance	mego	1				infinity		
4	Resistance	ohms	0				0.5		
5.a	Resistance	ohms	2.2				▨		
5.b	Resistance	ohms	11.0				▨		
5.c	Resistance	ohms	6.5				▨		
5.d	Resistance	ohms	11.0				▨		
5.e	Resistance	ohms	5.0				25.0		

*** TO BE USED AS REQUIRED OR DESIRED**

DATE ________

JOB LEM G & N SYSTEM PASSIVE TEST | JDC 12608 REV. C PAGE 1 OF 3
INITIAL TDRR 25341 D.S. PGS 1

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Connect appropriate cables and check for continuity and ground isolation.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-16-66	27209		1	WK	TM
B	4-26-66	28334	1	-	WK	ACM
C	5-6-66	28590	All	All	MM	ACM

M

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone Bridge or equivalent and voltohmmeter

PROCEDURE

1. Insure that the cable connections specified in Table 1 are complied with.

2. Using a voltohmmeter, measure the resistance between the following pins:

	GRD SYSTEM	FROM (+)	GRD SYSTEM	TO (-)
a.	0 VDC IMU	W137-P1-B	0 VDC CDU	W137-P1-M
b.	0 VDC IMU	W137-P1-B	0 VDC LGC	W137-P1-L
c.	0 VDC LGC	W137-P1-L	0 VDC CDU	W137-P1-M
d.	0 VDC Optics Heater	W135-P1-K	115V 400 cps Optics Low	W135-P1-N
e.	0 VDC IMU	W137-P1-B	SMF	E1
f.	0 VDC CDU	W137-P1-M	SMF	E1
g.	0 VDC LGC	W137-P1-L	SMF	E1
h.	0 VDC Optics Heater	W135-P1-K	SMF	W135-P1-A
i.	115V 400 cps Optics Low	W135-P1-N	SMF	W135-P1-A

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB LEM G & N SYSTEM PASSIVE TEST | JDC 12608 REV C PAGE 2 OF 3

SUBSYSTEM LEM G & N SYSTEM | ASSY

3. Using a Wheatstone Bridge, measure the resistance between point E2 and Facility Ground with 56P4 connected to the LGC.

4. Using a Wheatstone Bridge, measure the resistance between the following pins:

	FROM (+)	TO (-)
a.	W137-P1-A	W137-P1-B
b.	W137-P1-H	W137-P1-B
c.	W137-P1-K	W137-P1-L
d.	W135-P1-J	W135-P1-K
e.	W135-P1-L	W135-P1-N

Table 1

Cable Connections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1		Do Not Connect to GDB
	56P5 (J221)	P3	W143 (6900025)	P1	J1	DSKY
				P2		Do Not Connect to GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
Do Not Connect to "B" Harness		P4		P9	J14	GDB
		P2	W120 (2900456)	P1	J19	OIA
Do Not Connect to PTA		P2	W144 (6900006)	P1	J1	TPA-1

DATE ________

JOB LEM G & N SYSTEM PASSIVE TEST | JDC 12608 REV C PAGE 3 OF 3

SUBSYSTEM LEM G & N SYSTEM | ASSY

Table 1 (cont)

Cable Connections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
Do Not Connect to "A" Harness		P2 P3 P4 P5 P6	W131 (6900023)	P1 P2 P10	J13 J16 J15	OIA
Do Not Connect to LGC		56P4	"A" Harness			
Do Not Connect to SCM Breakout		56P1				
Do Not Connect to LGC Test Connector		P2	W226 (2014137)	P1	J4	LGC Buffer Assembly
Do Not Connect to GDB		P1	W135 (6900024)	P3 P2	J1 P1	Computer Control and Reticle Dimmer Assembly

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12608
REV. C
INITIAL TDRR 25341

JOB LEM G & N SYSTEM PASSIVE TEST

ASSEMBLY UNDER TEST
TITLE ________
SER. NO. ________ DWG ________ REV. ________

TEST HISTORY
DATE ________ START ________ END ________ SITE / LOCATION
TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ________ SER. NO. ________ CAL DATE
NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	Resistance	ohms	200				infinity		
2.b	Resistance	meg	1				infinity		
2.c	Resistance	meg	1				infinity		
2.d	Resistance	meg	1				infinity		
2.e	Resistance	meg	1				infinity		
2.f	Resistance	meg	1				infinity		
2.g	Resistance	meg	1				infinity		
2.h	Resistance	meg	1				infinity		
2.i	Resistance	meg	1				infinity		
3	Resistance	ohms	0				0.5		
4.a	Resistance	ohms	2.2				▨		
4.b	Resistance	ohms	11.0				▨		
4.c	Resistance	ohms	6.5				▨		
4.d	Resistance	ohms	11.0				▨		
4.e	Resistance	ohms	5.0				25.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE ________

JOB LEM G & N SYSTEM PASSIVE TEST	JDC 12608 REV. D PAGE 1 OF 3 INITIAL TDRR 25341 D.S. PGS 1
SUBSYSTEM LEM G & N SYSTEM	ASSY.

DESCRIPTION Connect appropriate cables and check for continuity and ground isolation.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-16-66	27209		1	WK	TM
B	4-26-66	28334	1	-	WK	ACM
C	5-6-66	28590	All	All	MM	ACM
D	7-5-66	30041	3	-	MM	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone Bridge or equivalent and voltohmmeter

PROCEDURE

1. Insure that the cable connections specified in Table 1 are complied with.

2. Using a voltohmmeter, measure the resistance between the following pins:

	GRD SYSTEM	FROM (+)	GRD SYSTEM	TO (-)
a.	0 VDC IMU	W137-P1-B	0 VDC CDU	W137-P1-M
b.	0 VDC IMU	W137-P1-B	0 VDC LGC	W137-P1-L
c.	0 VDC LGC	W137-P1-L	0 VDC CDU	W137-P1-M
d.	0 VDC Optics Heater	W135-P1-K	115V 400 cps Optics Low	W135-P1-N
e.	0 VDC IMU	W137-P1-B	SMF	E1
f.	0 VDC CDU	W137-P1-M	SMF	E1
g.	0 VDC LGC	W137-P1-L	SMF	E1
h.	0 VDC Optics Heater	W135-P1-K	SMF	W135-P1-A
i.	115V 400 cps Optics Low	W135-P1-N	SMF	W135-P1-A

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ________

JOB LEM G & N SYSTEM PASSIVE TEST	JDC 12608 REV D PAGE 2 OF 3
SUBSYSTEM LEM G & N SYSTEM	ASSY

3. Using a Wheatstone Bridge, measure the resistance between point E2 and Facility Ground with 56P4 connected to the LGC.

4. Using a Wheatstone Bridge, measure the resistance between the following pins:

	FROM (+)	TO (-)
a.	W137-P1-A	W137-P1-B
b.	W137-P1-H	W137-P1-B
c.	W137-P1-K	W137-P1-L
d.	W135-P1-J	W135-P1-K
e.	W135-P1-L	W135-P1-N

Table 1

Cable Connections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1		Do Not Connect to GDB
	56P5 (J221)	P3	W143 (6900025)	P1	J1	DSKY
				P2		Do Not Connect to GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
Do Not Connect to "B" Harness		P4		P9	J14	GDB
		P2	W120 (2900456)	P1	J19	OIA
Do Not Connect to PTA		P2	W144 (6900006)	P1	J1	TPA-1

DATE ________

JOB LEM G & N SYSTEM PASSIVE TEST	JDC 12608 REV D PAGE 3 OF 3
SUBSYSTEM LEM G & N SYSTEM	ASSY

Table 1 (cont)

Cable Connections						
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
Do Not Connect to "A" Harness		P9 P3 P4 P5 P6	W131 (6900023)	P1 P2 P10	J13 J16 J15	GDB
Do Not Connect to LGC		56P4	"A" Harness			
Do Not Connect to SCM Breakout		56P1				
Do Not Connect to LGC Test Connector		P2	W226 (2014137)	P1	J4	LGC Buffer Assembly
Do Not Connect to GDB		P1	W135 (6900024)	P3 P2	J1 P1	Computer Control and Reticle Dimmer Assembly

DATE ________

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12608
REV. D
INITIAL TDRR 25341

JOB LEM G & N SYSTEM PASSIVE TEST

ASSEMBLY UNDER TEST

TITLE ________

SER. NO. ________ DWG ________ REV. ________

TEST HISTORY

DATE ________ START ________ END ________ SITE / LOCATION

TIME ________ START ________ END ________ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ________ SER. NO. ________ CAL DATE

NAME ________ SER. NO. ________ CAL DATE

CONDUCTED BY ________ NAME/AFFILIATION APPROVED BY ________ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	Resistance	ohms	200				infinity		
2.b	Resistance	meg	1				infinity		
2.c	Resistance	meg	1				infinity		
2.d	Resistance	meg	1				infinity		
2.e	Resistance	meg	1				infinity		
2.f	Resistance	meg	1				infinity		
2.g	Resistance	meg	1				infinity		
2.h	Resistance	meg	1				infinity		
2.i	Resistance	meg	1				infinity		
3	Resistance	ohms	0				0.5		
4.a	Resistance	ohms	2.2				▨		
4.b	Resistance	ohms	11.0				▨		
4.c	Resistance	ohms	6.5				▨		
4.d	Resistance	ohms	11.0				▨		
4.e	Resistance	ohms	5.0				25.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE ________

JOB LEM G & N SYSTEM PASSIVE TEST	JDC 12608 REV. E PAGE 1 OF 3
	INITIAL TDRR 25341 D.S. PGS 1
SUBSYSTEM LEM G & N SYSTEM	ASSY.

DESCRIPTION Connect appropriate cables and check for continuity and ground isolation.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-16-66	27209		1	WK	TM
B	4-26-66	28334	1	-	WK	ACM
C	5-6-66	28590	All	All	MM	ACM
D	7-5-66	30041	3	-	MM	-
E	9-22-66	31267	2,3	-	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone Bridge or equivalent and voltohmmeter

PROCEDURE

1. Insure that the cable connections specified in Table 1 are complied with.

2. Using a voltohmmeter, measure the resistance between the following pins:

	GRD SYSTEM	FROM (+)	GRD SYSTEM	TO (-)
a.	0 VDC IMU	W137-P1-B	0 VDC CDU	W137-P1-M
b.	0 VDC IMU	W137-P1-B	0 VDC LGC	W137-P1-L
c.	0 VDC LGC	W137-P1-L	0 VDC CDU	W137-P1-M
d.	0 VDC Optics Heater	W135-P1-K	115V 400 cps Optics Low	W135-P1-N
e.	0 VDC IMU	W137-P1-B	SMF	E1
f.	0 VDC CDU	W137-P1-M	SMF	E1
g.	0 VDC LGC	W137-P1-L	SMF	E1
h.	0 VDC Optics Heater	W135-P1-K	SMF	W135-P1-A
i.	115V 400 cps Optics Low	W135-P1-N	SMF	W135-P1-A

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

JOB LEM G & N SYSTEM PASSIVE TEST	JDC 12608 REV E PAGE 2 OF 3
SUBSYSTEM LEM G & N SYSTEM	ASSY

CAUTION: Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage.

3. Connect 56P4 of the "A" harness to the LGC and make resistance measurement as follows:

a. Visually inspect connector 56P4 and LGC connector to insure that pins and sockets are not bent or damaged. Install gasket on LGC connector.

b. Carefully locate harness plug 56P4 on the guide pins of LGC connector, ease plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

d. On the sides of the connector, tighten the two captive screws and torque to 19±1 in-lbs.

e. Using a Wheatstone Bridge, measure the resistance between point E2 and Facility Ground. Record.

4. Using a Wheatstone Bridge, measure the resistance between the following pins:

	FROM (+)	TO (-)
a.	W137-P1-A	W137-P1-B
b.	W137-P1-H	W137-P1-B
c.	W137-P1-K	W137-P1-L
d.	W135-P1-J	W135-P1-K
e.	W135-P1-L	W135-P1-N

DATE ______

JOB LEM G & N SYSTEM PASSIVE TEST	JDC 12608 REV E PAGE 3 OF 3
SUBSYSTEM LEM G & N SYSTEM	ASSY

Table 1

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1		Do Not Connect to GDB
	56P5 (J221)	P3	W143 (6900025)	P1	J1	DSKY
				P2		Do Not Connect to GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
Do Not Connect to "B" Harness		P4		P9	J14	GDB
		P2	W120 (2900456)	P1	J19	OIA
Do Not Connect to PTA		P2	W144 (6900006)	P1	J1	TPA-1
Do Not Connect to "A" Harness		P9	W131 (6900023)	P1	J13	GDB
		P3		P2	J16	
		P4		P10	J15	
		P5				
		P6				
Do Not Connect to LGC		56P4	"A" Harness			
Do Not Connect to SCM Breakout		56P1				
Do Not Connect to LGC Test Connector		P2	W226 (2014137)	P1	J4	LGC Buffer Assembly
Do Not Connect to GDB		P1	W135 (6900024)	P3	J1	Computer Control and Reticle Dimmer Assembly
				P2	P1	

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12608
REV. E
INITIAL TDRR 25341

JOB LEM G & N SYSTEM PASSIVE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ______	DATE ______ START ______ END ______ SITE / LOCATION
SER. NO. ______ DWG ______ REV. ______	TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______

NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
2.a	Resistance	ohms	200				infinity		
2.b	Resistance	meg	1				infinity		
2.c	Resistance	meg	1				infinity		
2.d	Resistance	meg	1				infinity		
2.e	Resistance	meg	1				infinity		
2.f	Resistance	meg	1				infinity		
2.g	Resistance	meg	1				infinity		
2.h	Resistance	meg	1				infinity		
2.i	Resistance	meg	1				infinity		
3	Resistance	ohms	0				0.5		
4.a	Resistance	ohms	2.2				▨		
4.b	Resistance	ohms	11.0				▨		
4.c	Resistance	ohms	6.5				▨		
4.d	Resistance	ohms	11.0				▨		
4.e	Resistance	ohms	5.0				25.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE ______

JOB LEM G & N SYSTEM PASSIVE TEST

JDC 12608 REV. - PAGE 1 OF 2
INITIAL TDRR 25341 D.S. PGS 1

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Connect appropriate cables and check for continuity and ground isolation.

Rev. Ltr.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

Wheatstone Bridge or equivalent

PROCEDURE

1. Connect GSE Cable W137-P2 to 56P8 and W135 to 50P1. Do not connect to GSE Distribution Box.

2. Insure that; W138, W143, W120, W136, W139, W131, W226 and W132 are not connected.

3. Using a wheatstone bridge, measure the resistance between following pins:

RE/ld

	GRD SYSTEM	FROM (+)	GRD SYSTEM	TO (-)
a.	0 VDC IMU	W137-P1-B	0 VDC CDU	W137-P1-M
b.	0 VDC IMU	W137-P1-B	0 VDC LGC	W137-P1-L
c.	0 VDC LGC	W137-P1-L	0 VDC CDU	W137-P1-M
d.	0 VDC Optics Heater	W135-P1-K	115V 400 cps Optics Low	W135-P1-N
e.	0 VDC IMU	W137-P1-B	SMF	E1
f.	0 VDC CDU	W137-P1-M	SMF	E1
g.	0 VDC LGC	W137-P1-L	SMF	E1
h.	0 VDC Optics Heater	W135-P1-K	SMF	E1
i.	115V 400 cps Optics Low	W135-P1-N	SMF	E1

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE ______

JOB LEM G & N SYSTEM PASSIVE TEST

JDC 12608 REV - PAGE 2 OF 2

SUBSYSTEM LEM G & N SYSTEM

ASSY

4. Using a wheatstone bridge, measure the resistance between point E2 and Facility Ground with 56P3 and 56P4 connected to CDU and LGC respectively.

5. Using a wheatstone bridge, measure the resistance between the following pins:

RE/ld

	FROM (+)	TO (-)
a.	W137-P1-A	W137-P1-B
b.	W137-P1-H	W137-P1-B
c.	W137-P1-K	W137-P1-L
d.	W135-P1-J	W135-P1-K
e.	W135-P1-L	W135-P1-N

DATE ______

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12608
REV. -
INITIAL TDRR 25341

JOB LEM G & N SYSTEM PASSIVE TEST

ASSEMBLY UNDER TEST

TITLE ______

SER. NO. ______ DWG ______ REV. ______

TEST HISTORY

DATE ______ START ______ END ______ SITE / LOCATION

TIME ______ START ______ END ______ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ______ SER. NO. ______ CAL DATE ______

NAME ______ SER. NO. ______ CAL DATE ______

CONDUCTED BY ______ NAME/AFFILIATION

APPROVED BY ______ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
3.a	Resistance	ohms	200				infinity		
3.b	Resistance	ohms	200				infinity		
3.c	Resistance	ohms	200				infinity		
3.d	Resistance	ohms	100				infinity		
3.e	Resistance	ohms	100				infinity		
3.f	Resistance	ohms	100				infinity		
3.g	Resistance	ohms	100				infinity		
3.h	Resistance	mego	1				infinity		
3.i	Resistance	mego	1				infinity		
4	Resistance	ohms	0				0.5		
5.2	Resistance	ohms	2.2				▨		
5.b	Resistance	ohms	11.0				▨		
5.c	Resistance	ohms	6.5				▨		
5.d	Resistance	ohms	11.0				▨		
5.e	Resistance	ohms	39.0				▨		

* TO BE USED AS REQUIRED OR DESIRED

DATE ______

JOB G & N SYSTEM CABLE CONNECTIONS

JDC 12609 **REV.** A **PAGE** 1 **OF** 3

INITIAL TDRR 27134 **D.S. PGS** -

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA
A	5-6-66	28591	2	-	MM	ACM

REFERENCES PS 6015000

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

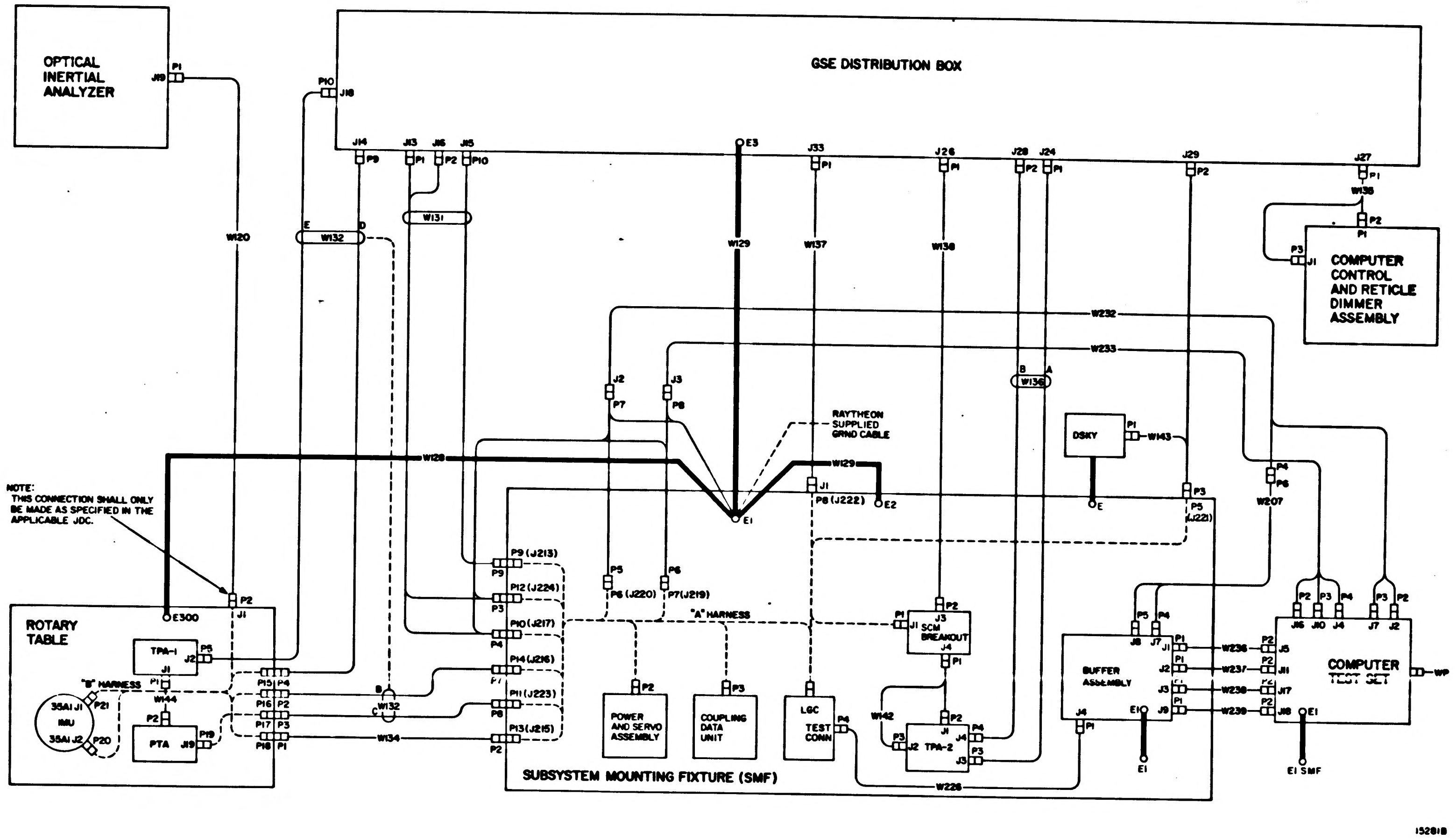
Table 1

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB
	56P5 (J221)	P3	W143 (6900026)	P1	J1	DSKY
				P2	J29	GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
	56P9 (J213)	P2	W131 (6900023)	P1	J13	OIA
	56P12 (J224)	P3		P2	J16	
	56P10 (J217)	P4		P10	J15	
	56P6 (J220)	P5				
	56P7 (J219)	P6				
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14	GDB
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1
LGC	05A5J1	56P4	"A" Harness			
SCM Breakout	J1	56P1				
LGC	Test Conn.	P2	W226 (2014137)	P1	J4	LGC Buffer Assembly
GDB	J27	P1	W135 (6900024)	P3 P2	J1 P1	Computer Control and Reticle Dimmer Assembly

DATE ____________

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV A PAGE 3 OF 3
SUBSYSTEM LEM G & N SYSTEM	ASSY



GSE DISTRIBUTION BOX
OPTICAL INERTIAL ANALYZER
J19 P1
W120
P10 J18
J14 P9
J13 P1
J16 P2
J15 P10
E W132 D
W131
E3
W129
J33 P1
W137
J26 P1
W138
J28 P2
J24 P1
J29 P2
J27 P1
W135
P2 P1
P3 J1
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
W232
W233
B W136 A
J2 P7
J3 P8
RAYTHEON SUPPLIED GRND CABLE
DSKY
P1 W143
W128
W129
J1 P8 (J222)
E2
E1
E
P3 P5 (J221)
P4 P6
W207
NOTE: THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
P2 J1
E300
ROTARY TABLE
TPA-1 J2 P5 J1
"B" HARNESS
P1 W144 P2
35A1 J1 IMU 35A1 J2
P21 P20
PTA J19 P19
P15 P4
P16 P2
P17 P3
P18 P1
B W132 C
W134
P9 (J213) P9
P12 (J224) P3
P10 (J217) P4
P14 (J216) P7
P11 (J223) P8
P13 (J215) P2
P5 P6 (J220)
P6 P7 (J219)
"A" HARNESS
P2 POWER AND SERVO ASSEMBLY
P3 COUPLING DATA UNIT
LGC TEST CONN P4
P1 J1 SCM BREAKOUT J3 P2 J4 P1
W142
P3 J2 TPA-2 J1 P2 J4 P4 J3 P3
W226
SUBSYSTEM MOUNTING FIXTURE (SMF)
BUFFER ASSEMBLY
P5 P4 J8 J7
J1 P1 W236 P2 J5
J2 P1 W237 P2 J11
J3 P1 W238 P2 J17
J9 P1 W239 P2 J18
J4 P1
E1
E1
COMPUTER TEST SET
P2 P3 P4 J16 J10 J4
P3 P2 J7 J2
WP
E1
E1 SMF
152818

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV. B PAGE 1 OF 4 INITIAL TDRR 27134 D.S. PGS -
SUBSYSTEM LEM G & N SYSTEM	ASSY.

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-6-66	28591	2	-	MM	ACM
B	7-5-66	30042	2	-	MM	ACM

REFERENCES PS 6015000

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV B PAGE 2 OF 4
SUBSYSTEM LEM G & N SYSTEM	ASSY

Table 1

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB
	56P5 (J221)	P3	W143 (6900026)	P1	J1	DSKY
				P2	J29	GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
	56P9 (J218)	P2	W131 (6900023)	P1	J13	GDB
	56P12 (J224)	P3		P2	J16	
	56P10 (J217)	P4		P10	J15	
	56P6 (J220)	P5				
	56P7 (J219)	P6				
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14	GDB
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1
LGC	05A5J1	56P4	"A" Harness			
SCM Breakout	J1	56P1				
LGC	Test Conn.	P2	W226 (2014137)	P1	J4	LGC Buffer Assembly
GDB	J27	P1	W135 (6900024)	P3	J1	Computer Control and Reticle Dimmer Assembly
				P2	P1	

DATE ____

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV B PAGE 3 OF 4
SUBSYSTEM LEM G & N SYSTEM	ASSY

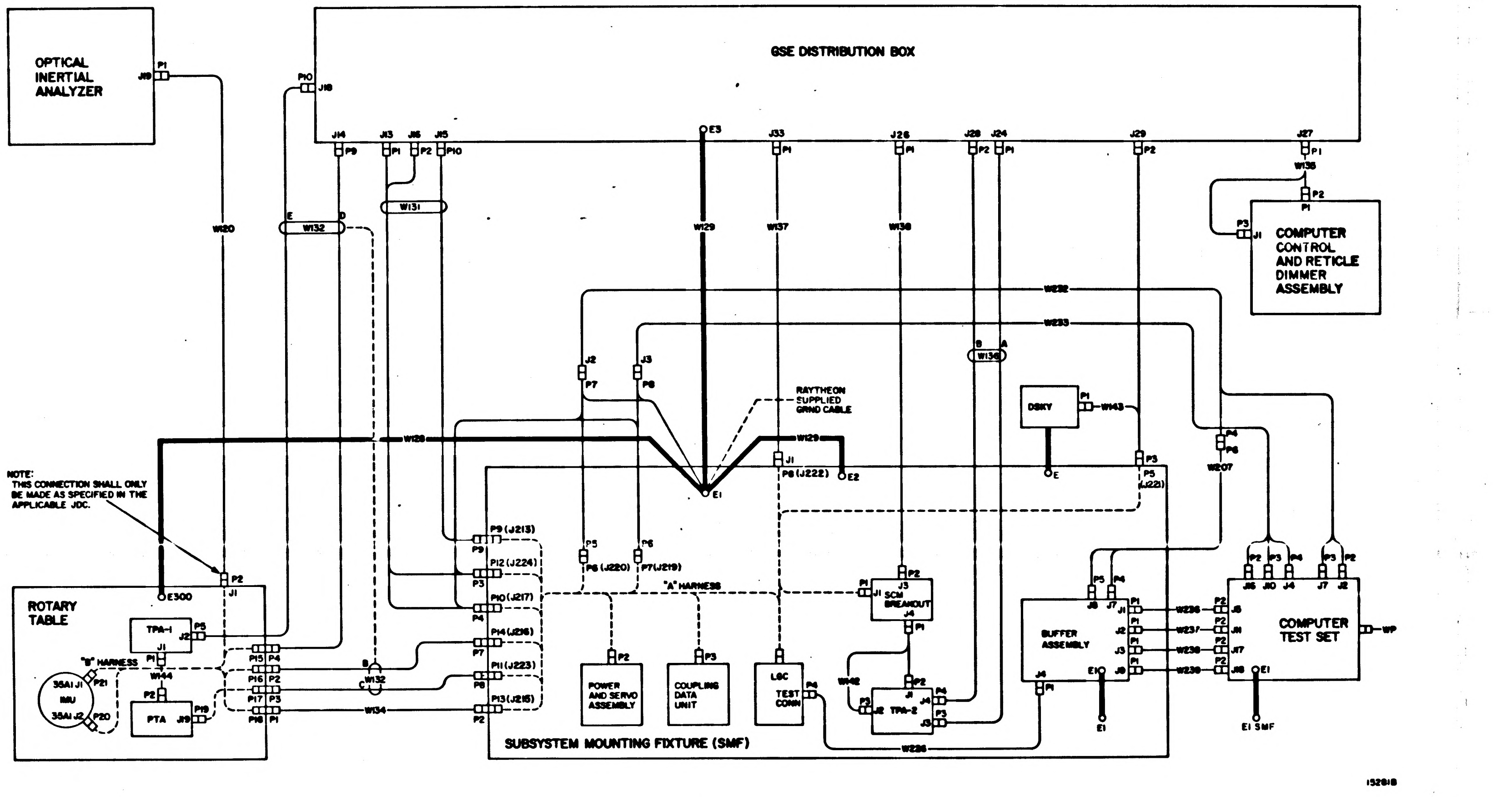

GSE DISTRIBUTION BOX
OPTICAL INERTIAL ANALYZER
J19 P1
P10 J18
J14 P9
J13 P1
J16 P2
J15 P10
E3
J33 P1
J26 P1
J28 P2
J24 P1
J29 P2
J27 P1
W136
P2 P1
P3 J1
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
W120
E W132 D
W131
W129
W137
W138
W232
W233
B A W136
J2 P7
J3 P8
RAYTHEON SUPPLIED GRND CABLE
DSKY
P1 W143
W128
W129
J1 P8 (J222)
E2
E
P3 P5 (J221)
P4 P6
W207
E1
NOTE: THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
P2 J1
E300
ROTARY TABLE
TPA-1
J2 P5
J1 P1
"B" HARNESS
W144
35A1 J1 P21
IMU
35A1 J2 P20
P2
PTA J19 P19
P15 P4
P16 P2
P17 P3
P18 P1
B W132 C
W134
P9 (J213)
P9
P12 (J224)
P3
P10 (J217)
P4
P14 (J216)
P7
P11 (J223)
P8
P13 (J215)
P2
P5 P6 (J220)
P6 P7 (J219)
"A" HARNESS
P2
POWER AND SERVO ASSEMBLY
P3
COUPLING DATA UNIT
LGC TEST CONN P4
P1 J1 J3 SCM BREAKOUT J4 P1
P2
W142
P3 J2 TPA-2 J1 J4 P4 J3 P3
W235
SUBSYSTEM MOUNTING FIXTURE (SMF)
P5 P4
J8 J7
BUFFER ASSEMBLY
J1 P1
J2 P1
J3 P1
J9 P1
E1
J4 P1
E1
W236
W237
W238
W239
P2 J5
P2 J11
P2 J17
P2 J18
E1
E1 SMF
P2 P3 P4 P3 P2
J16 J10 J4 J7 J2
COMPUTER TEST SET
WP
152818

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | **JDC** 12609 **REV** B **PAGE** 4 **OF** 4

SUBSYSTEM LEM G & N SYSTEM | **ASSY**

Table 1 (cont)

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
SCM	J4	P1	W142 (6900041)	P2 P3	J1 J2	TPA-2
	J3	P2	W138 (6900040)	P1	J26	GDB

DATE ________

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV. C PAGE 1 OF 4
	INITIAL TDRR 27134 D.S. PGS -
SUBSYSTEM LEM G & N SYSTEM	ASSY.

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-6-66	28591	2	-	MM	ACM
B	7-5-66	30042	2	-	MM	ACM
C	7-21-66	30270	2, 3	-	EA	MB

REFERENCES PS 6015000

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV C PAGE 2 OF 4
SUBSYSTEM LEM G & N SYSTEM	ASSY

Table 1

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY
				P2	J29	GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
	56P9 (J218)	P2	W131 (6900023)	P1	J13	GDB
	56P12 (J224)	P3		P2	J16	
	56P10 (J217)	P4		P10	J15	
	56P6 (J220)	P5				
	56P7 (J219)	P6				
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14	GDB
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1
LGC	05A5J1	56P4	"A" Harness			
SCM Breakout	J1	56P1				
LGC	Test Conn.	P2	W226 (2014137)	P1	J4	LGC Buffer Assembly
GDB	J27	P1	W135 (6900024)	P3	J1	Computer Control and Reticle Dimmer Assembly
				P2	P1	

DATE ______

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV C PAGE 3 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY

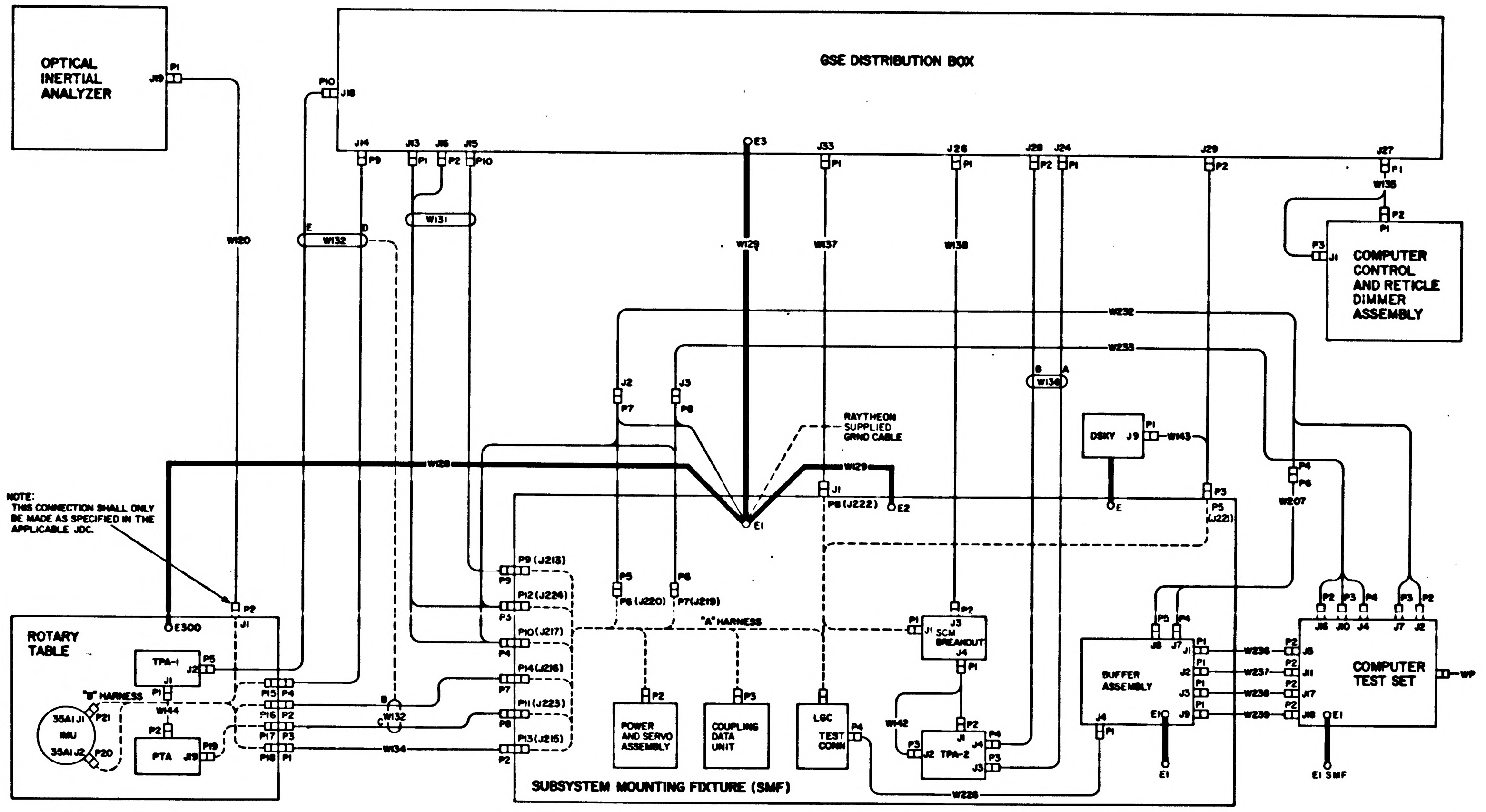

OPTICAL INERTIAL ANALYZER
GSE DISTRIBUTION BOX
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
ROTARY TABLE
TPA-1
PTA
35A1 J1
IMU
35A1 J2
"B" HARNESS
"A" HARNESS
NOTE: THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
RAYTHEON SUPPLIED GRND CABLE
DSKY
SCM BREAKOUT
TPA-2
POWER AND SERVO ASSEMBLY
COUPLING DATA UNIT
LGC TEST CONN
BUFFER ASSEMBLY
COMPUTER TEST SET
SUBSYSTEM MOUNTING FIXTURE (SMF)
E1 SMF
W120
W128
W129
W131
W132
W134
W136
W137
W138
W139
W142
W143
W144
W207
W226
W232
W233
W236
W237
W238
W239
E300
E1
E2
E3
P9 (J213)
P12 (J224)
P10 (J217)
P14 (J216)
P11 (J223)
P13 (J215)
P6 (J220)
P7 (J219)
P8 (J222)
P5 (J221)

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | **JDC** 12609 **REV** C **PAGE** 4 **OF**

SUBSYSTEM LEM G & N SYSTEM | **ASSY**

Table 1 (cont)

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
SCM	J4	P1	W142 (6900041)	P2 P3	J1 J2	TPA-2
	J3	P2	W138 (6900040)	P1	J26	GDB

DATE ______

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV. D PAGE 1 OF 4	INITIAL TDRR 27134 D.S. PGS -
SUBSYSTEM LEM G & N SYSTEM	ASSY.	

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-6-66	28591	2	-	MM	ACM
B	7-5-66	30042	2	-	MM	ACM
C	7-21-66	30270	2, 3	-	EA	MB
D	8-4-66	30403	1	-	EA	-

REFERENCES PS 6015000

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE. Connect 56P1 of "A" harness to J1 of SCM Breakout. Connect 56P4 of "A" harness to 05 A5 J1 of LGC. Torque both connectors to 19±1 in. lb.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

FORM 0-0143
Chg. 7-23-65

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV D PAGE 2 OF 4	
SUBSYSTEM LEM G & N SYSTEM	ASSY	

Table 1

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY
				P2	J29	GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
	56P9 (J218)	P2	W131 (6900023)	P1	J13	GDB
	56P12 (J224)	P3		P2	J16	
	56P10 (J217)	P4		P10	J15	
	56P6 (J220)	P5				
	56P7 (J219)	P6				
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14	GDB
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1
LGC	05A5J1	56P4	"A" Harness			
SCM Breakout	J1	56P1				
LGC	Test Conn.	P2	W226 (2014137)	P1	J4	LGC Buffer Assembly
GDB	J27	P1	W135 (6900024)	P3 P2	J1 P1	Computer Control and Reticle Dimmer Assembly

DATE

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV D PAGE 3 OF 4
SUBSYSTEM LEM G & N SYSTEM	ASSY

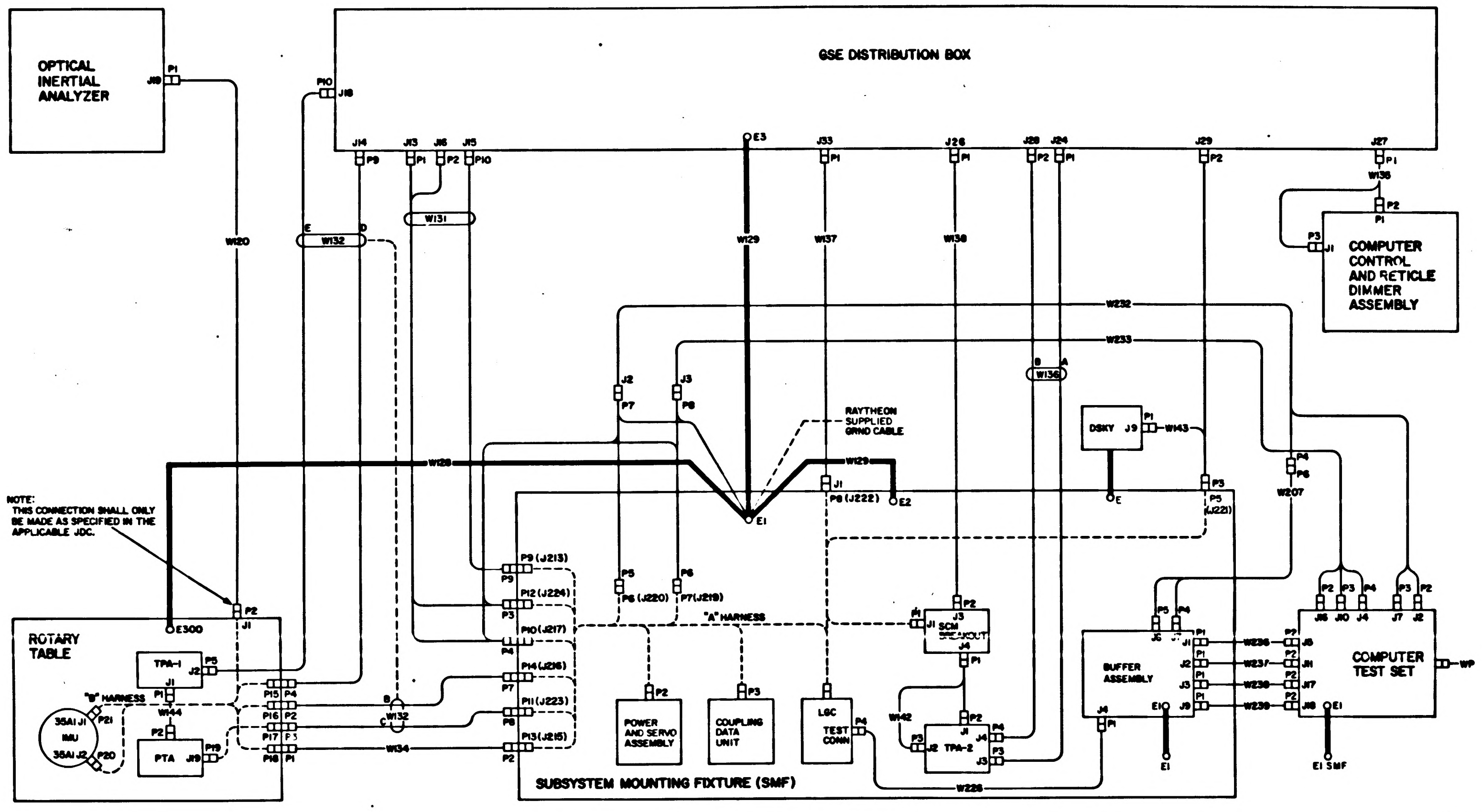

GSE DISTRIBUTION BOX
OPTICAL INERTIAL ANALYZER
J18 P1
P10 J18
J14 P9
J13 P1
J16 P2
J15 P10
E3
J33 P1
J26 P1
J28 P2
J24 P1
J29 P2
J27 P1
W136
P2 P1
P3 J1
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
W120
W132
E D
W131
W129
W137
W138
W232
W233
J2 P7
J3 P8
B A
W136
RAYTHEON SUPPLIED GRND CABLE
DSKY J9
P1 W143
W128
W129
J1 P8 (J222)
E2
E1
E
P3 P5 (J221)
P4 P6
W207
NOTE:
THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
P2 J1
E300
ROTARY TABLE
TPA-1 J2 P5
J1 P1
"B" HARNESS
W144
P2
35A1 J1
IMU
35A1 J2
P21
P20
PTA J19 P19
P15 P4
P16 P2
P17 P3
P18 P1
B
W132
C
W134
P9 (J213)
P9
P12 (J224)
P3
P10 (J217)
P4
P14 (J216)
P7
P11 (J223)
P6
P13 (J215)
P2
P5
P6 (J220)
P6
P7 (J219)
"A" HARNESS
P2
POWER AND SERVO ASSEMBLY
P3
COUPLING DATA UNIT
LGC TEST CONN
P4
P1 J1
J3 SCM BREAKOUT
J4
P2
P1
W142
P2
P3 J2 TPA-2
J1
J4 P4
J3 P3
W226
SUBSYSTEM MOUNTING FIXTURE (SMF)
P5 P4
J6 J7
BUFFER ASSEMBLY
J1 P1
J2 P1
J3 P1
J9 P1
J4 P1
E1
E1
W236
W237
W238
W239
P7 J6
P2 J11
P2 J17
P2 J18
E1
E1 SMF
P2 P3 P4
J16 J10 J4
P3 P2
J7 J2
COMPUTER TEST SET
WP
13201C

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS **JDC** 12609 **REV** D **PAGE** 4 **OF** 4

SUBSYSTEM LEM G & N SYSTEM **ASSY**

Table 1 (cont)

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
SCM	J4	P1	W142 (6900041)	P2	J1	TPA-2
				P3	J2	
	J3	P2	W138 (6900040)	P1	J26	GDB

DATE ______

JOB G & N SYSTEM CABLE CONNECTIONS
JDC 12609 REV. E PAGE 1 OF 4
INITIAL TDRR 27134 D.S. PGS -
SUBSYSTEM LEM G & N SYSTEM
ASSY.
DESCRIPTION Performance of GSE to A/B cable connections.

	Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
				JDC	D.S.	MIT	NASA
M	A	5-6-66	28591	2	-	MM	ACM
@	B	7-5-66	30042	2	-	MM	ACM
M	C	7-21-66	30270	2, 3	-	EA	MB
M	D	8-4-66	30403	1	-	EA	-
	E	9-22-66	31268	1,2,4	-	EA	-

REFERENCES PS 6015000

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

FORM 00143
Clg. 7-23-65

JOB G & N SYSTEM CABLE CONNECTIONS
JDC 12609 REV E PAGE 2 OF 4
SUBSYSTEM LEM G & N SYSTEM
ASSY

Table 1

Cable Connections

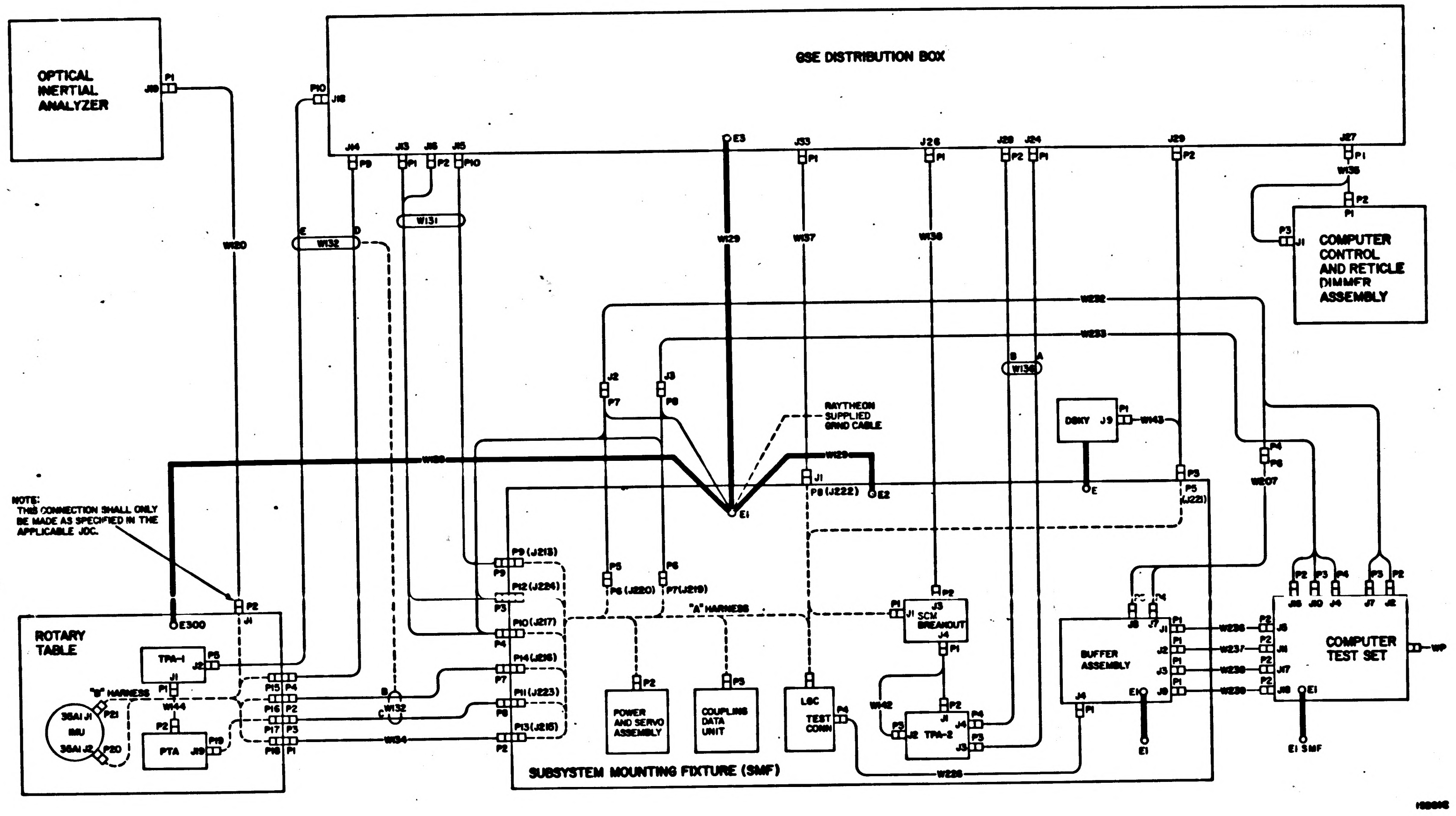
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY
				P2	J29	GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
	56P9 (J218)	P2	W131 (6900023)	P1	J13	GDB
	56P12 (J224)	P3		P2	J16	
	56P10 (J217)	P4		P10	J15	
	56P6 (J220)	P5				
	56P7 (J219)	P6				
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14	GDB
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1
LGC	05A5J1	56P4	"A" Harness*			
SCM Breakout	J1	56P1				
LGC	Test Conn.	P2	W226 (2014137)	P1	J4	LGC Buffer Assembly
GDB	J27	P1	W135 (6900024)	P3 P2	J1 P1	Computer Control and Reticle Dimmer Assembly

DATE

FORM 00145
Chg. 7-23-65

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV E PAGE 3 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY



GSE DISTRIBUTION BOX
OPTICAL INERTIAL ANALYZER
J18 P1
W130
P10 J16
J14 P9
J13 P1
J16 P2
J15 P10
W131
E W132 D
E3
W129
J33 P1
W137
J26 P1
W138
J28 P2
J24 P1
J29 P2
J27 P1
W135
P2 P1
P3 J1
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
W232
W233
B W136 A
J2 P7
J3 P8
RAYTHEON SUPPLIED GRND CABLE
DSKY J9
P1 W143
E
W128
W129
J1 P8 (J222)
E2
E1
P3
P5 (J221)
P4 P6
W207
NOTE: THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
E300
P2 J1
ROTARY TABLE
TPA-1
P6 J2
J1 P1
"B" HARNESS
W144
38AI J1 P21
IMU
38AI J2 P20
P2
PTA J19
P19
P15 P4
P16 P2
P17 P3
P18 P1
B W132 C
W134
P9 (J213)
P9
P12 (J224)
P3
P10 (J217)
P4
P14 (J216)
P7
P11 (J223)
P8
P13 (J215)
P2
P5 P6 (J220)
P6 P7 (J219)
"A" HARNESS
P2
POWER AND SERVO ASSEMBLY
P3
COUPLING DATA UNIT
LSC TEST CONN
P4
P1 J1
J3 SCM BREAKOUT J4
P2 P1
W142
P2 J1
P3 J2 TPA-2
J4 P4
J3 P5
W228
SUBSYSTEM MOUNTING FIXTURE (SMF)
BUFFER ASSEMBLY
J8 J7
J1 P1
J2 P1
J3 P1
J9 P1
E1
J4 P1
E1
W236
W237
W238
W239
P2 J5
P2 J11
P2 J17
P2 J18
P2 P3 P4 P3 P2
J16 J10 J4 J7 J2
COMPUTER TEST SET
WP
E1
E1 SMF

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | **JDC** 12609 **REV** E **PAGE** 4 **OF** 4

SUBSYSTEM LEM G & N SYSTEM | **ASSY**

Table 1 (cont)

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
SCM	J4	P1	W142 (6900041)	P2 P3	J1 J2	TPA-2
	J3	P2	W138 (6900040)	P1	J26	GDB

*Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage. Use the following procedure to properly connect 56P4 to 05A5J1 and 56P1 to J1:

a. Visually inspect 56P4 and 56P1 of "A" harness, 05A5J1 of LGC and J1 of SCM Breakout to insure that pins and sockets are not bent or damaged.

b. Install gasket on LGC connector and SCM Breakout connector.

c. Carefully locate 56P4 on the guide pins of 05A5J1, ease plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

d. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

e. On the sides of the connector, tighten the two captive screws and torque to 19±1 in-lbs.

f. Carefully locate 56P1 on the guide pins of J1 on SCM Breakout, ease the plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

g. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

h. On the sides of the connector, tighten the two captive screws and torque to 19±1 in-lbs.

DATE ________

JOB G & N SYSTEM CABLE CONNECTIONS
JDC 12609 REV. F PAGE 1 OF 4
INITIAL TDRR 27134 D.S. PGS -

SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-6-66	28591	2	-	MM	ACM
B	7-5-66	30042	2	-	MM	ACM
C	7-21-66	30270	2, 3	-	EA	MB
D	8-4-66	30403	1	-	EA	-
E	9-22-66	31268	1, 2, 4	-	EA	-
F	11-25-66	32060	2, 3	-	EA	-

REFERENCES PS 6015000

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

FORM 00143
Chg. 7-23-65

JOB G & N SYSTEM CABLE CONNECTIONS
JDC 12609 REV F PAGE 2 OF 4

SUBSYSTEM LEM G & N SYSTEM
ASSY

Table 1

Cable Connections

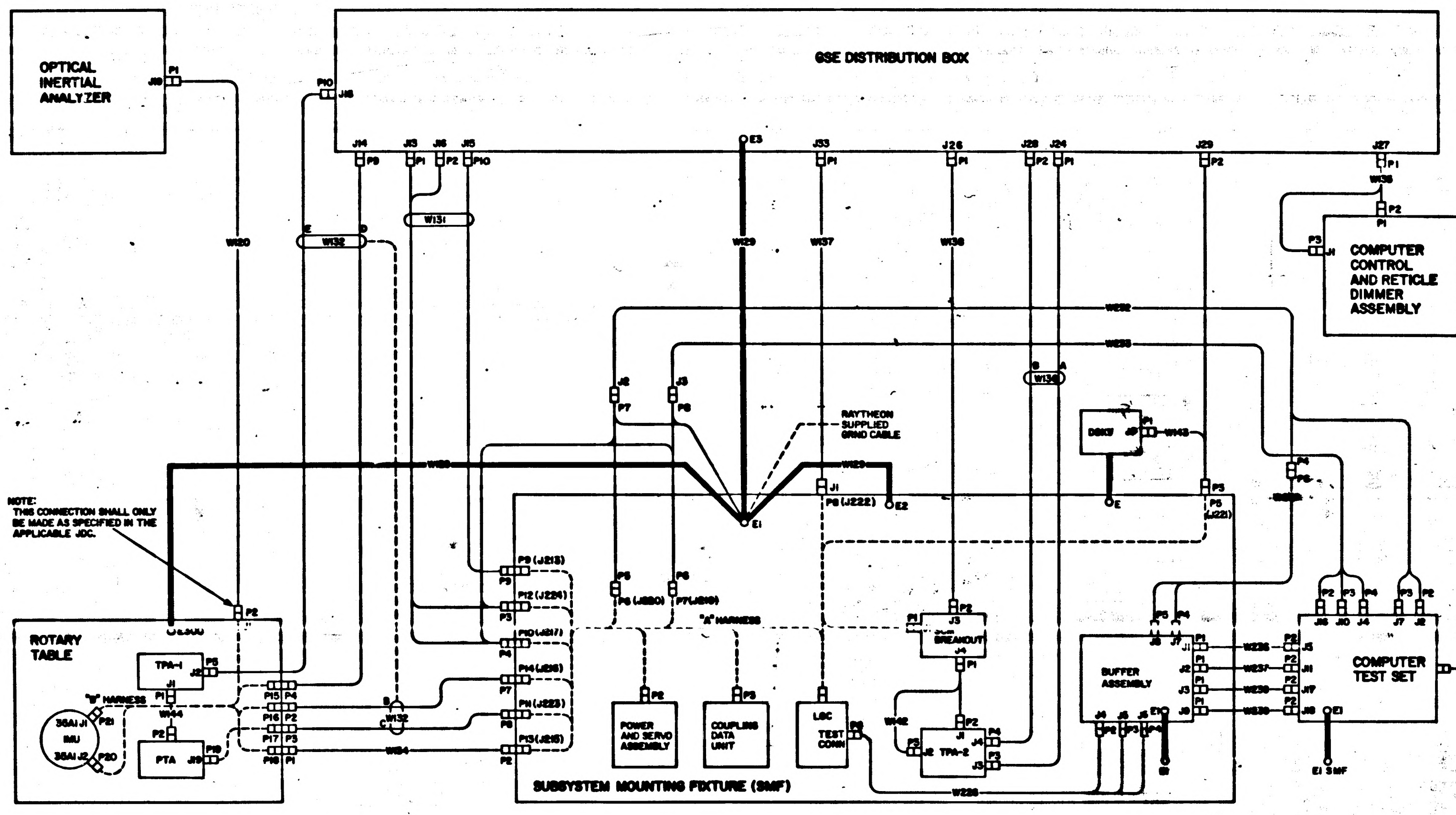
From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY
				P2	J29	GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
	56P9 (J218)	P2	W131 (6900023)	P1	J13	GDB
	56P12 (J224)	P3		P2	J16	
	56P10 (J217)	P4		P10	J15	
	56P6 (J220)	P5				
	56P7 (J219)	P6				
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14	GDB
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1
LGC	05A5J1	56P4	"A" Harness*			
SCM Breakout	J1	56P1				
LGC	Test Conn.	P1	W226 (2014137)	P2 P3 P4	J4 J5 J6	LGC Buffer Assembly
GDB	J27	P1	W135 (6900024)	P3	J1	Computer Control and Reticle Dimmer Assembly
				P2	P1	

DATE

FORM 00145
Chg. 7-13-65

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV F | PAGE 3 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY



OPTICAL INERTIAL ANALYZER
J10
P1
GSE DISTRIBUTION BOX
P10
J18
J14
P9
J13
P1
J16
P2
J15
P10
E3
J33
P1
J26
P1
J28
P2
J24
P1
J29
P2
J27
P1
W120
W132
E
D
W131
W129
W137
W136
W135
P2
P1
P3
J1
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
W232
W233
B
A
W136
J2
P7
J3
P8
RAYTHEON SUPPLIED GRND CABLE
DSKY
J8
P1
W143
E
W129
J1
P8 (J222)
E2
E1
P3
P5 (J221)
P4
P6
NOTE:
THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
P2
ROTARY TABLE
TPA-1
J2
P5
J1
P1
"B" HARNESS
W144
36A1 J1
IMU
36A1 J2
P21
P20
P2
PTA
J19
P19
P15
P4
P16
P2
P17
P3
P18
P1
B
W132
C
W134
P9 (J213)
P9
P12 (J224)
P3
P10 (J217)
P4
P14 (J216)
P7
P11 (J223)
P8
P13 (J215)
P2
P5
P6 (J220)
P6
P7 (J219)
"A" HARNESS
P2
POWER AND SERVO ASSEMBLY
P3
COUPLING DATA UNIT
LGC TEST CONN
P8
P1
J3
SCM BREAKOUT
J4
P1
P2
W142
P5
J2
TPA-2
J1
P4
J4
P3
J3
W226
SUBSYSTEM MOUNTING FIXTURE (SMF)
P5
P4
J8
J7
BUFFER ASSEMBLY
J1
P1
J2
P1
J3
P1
J9
P1
E1
J4
P2
J5
P3
J6
P4
E1
W236
W237
W238
W239
P2
J5
P2
J11
P2
J17
P2
J18
E1
E1 SMF
P2
P3
P4
P3
P2
J16
J10
J4
J7
J2
COMPUTER TEST SET
WP

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

FORM 00145
Chg. 7-23-65

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV F PAGE 4 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY

Table 1 (cont)

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
SCM	J4	P1	W142 (6900041)	P2	J1	TPA-2
				P3	J2	
	J3	P2	W138 (6900040)	P1	J26	GDB

*Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage. Use the following procedure to properly connect 56P4 to 05A5J1 and 56P1 to J1:

a. Visually inspect 56P4 and 56P1 of "A" harness, 05A5J1 of LGC and J1 of SCM Breakout to insure that pins and sockets are not bent or damaged.

b. Install gasket on LGC connector and SCM Breakout connector.

c. Carefully locate 56P4 on the guide pins of 05A5J1, ease plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

d. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

e. On the sides of the connector, tighten the two captive screws and torque to 19±1 in-lbs.

f. Carefully locate 56P1 on the guide pins of J1 on SCM Breakout, ease the plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

g. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

h. On the sides of the connector, tighten the two captive screws and torque to 19±1 in-lbs.

DATE ________

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV. G PAGE 1 OF 4
INITIAL TDRR 27134 D.S. PG 3 -

SUBSYSTEM LEM G & N SYSTEM | ASSY.
DESCRIPTION Performance of GSE to A/B cable connections.

	Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
				JDC	D.S.	MIT	NASA
M	A	5-6-66	28591	2	-	MM	ACM
Ⓜ	B	7-5-66	30042	2	-	MM	ACM
M	C	7-21-66	30270	2, 3	-	EA	MB
Ⓜ	D	8-4-66	30403	1	-	EA	-
M	E	9-22-66	31268	1,2,4	-	EA	-
Ⓜ	F	11-25-66	32060	2, 3	-	EA	-
Ⓜ	G	3-16-67	33219	2,3	-	EA	-

REFERENCES PS 6015000

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

FORM 00143
Chg. 7-23-65

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV G PAGE 2 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY

Table 1

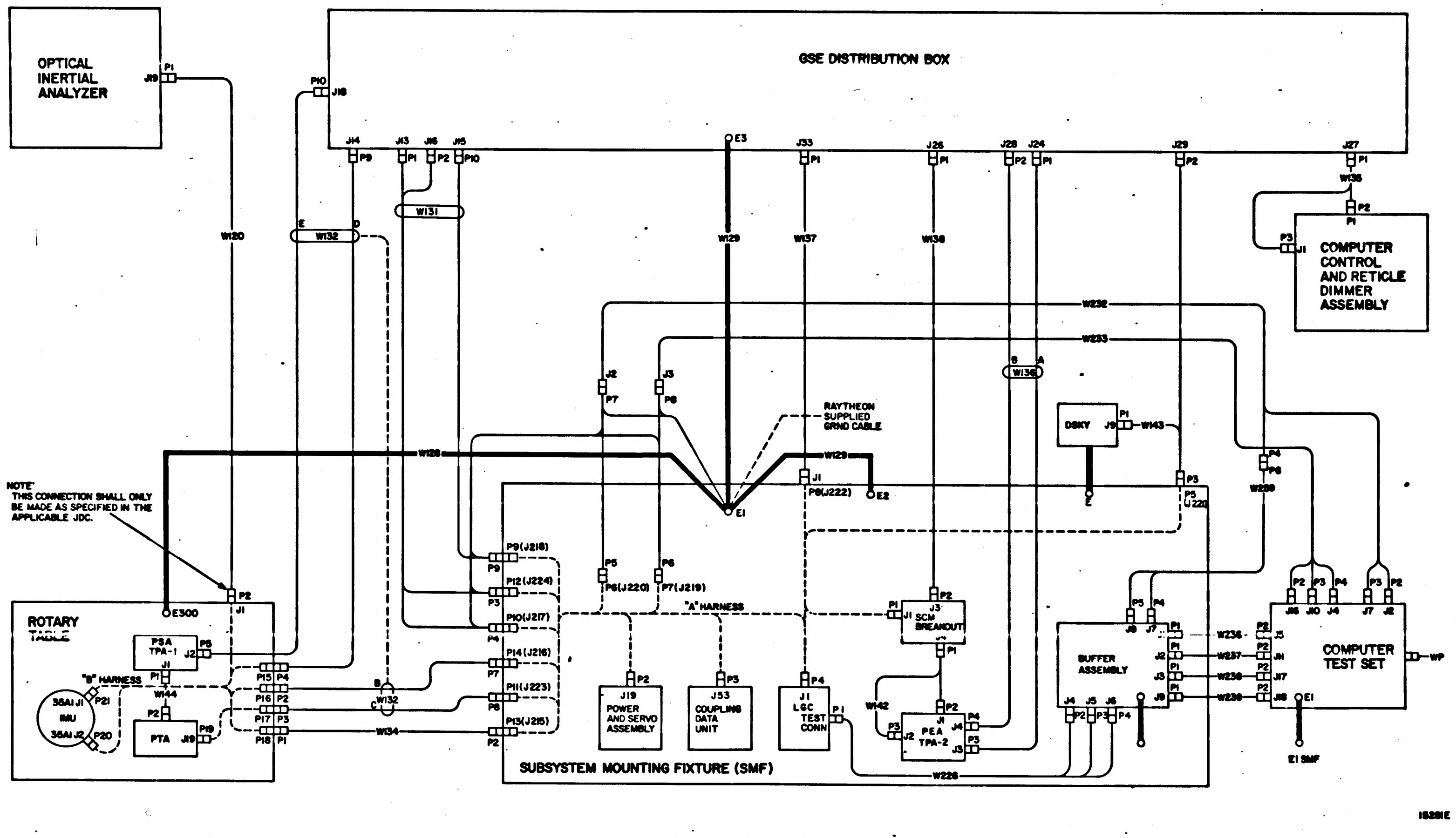
Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY
				P2	J29	GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
	56P9 (J218)	P2	W131 (6900023)	P1	J13	GDB
	56P12 (J224)	P3		P2	J16	
	56P10 (J217)	P4		P10	J15	
	56P6 (J220)	P5				
	56P7 (J219)	P6				
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14	GDB
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1
LGC	05A1J1	56P4	"A" Harness*			
SCM Breakout	J1	56P1				
LGC	Test Conn.	P1	W226 (2014137)	P2 P3 P4	J4 J5 J6	LGC Buffer Assembly
GDB	J27	P1	W135 (6900024)	P3 P2	J1 P1	Computer Control and Reticle Dimmer Assembly

DATE ________

FORM 00143
Chg. 7-23-6

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV G PAGE 3 OF 4
SUBSYSTEM LEM G & N SYSTEM	ASSY



OPTICAL INERTIAL ANALYZER
GSE DISTRIBUTION BOX
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
ROTARY TABLE
PSA TPA-1
PTA
IMU
36A1 J1
36A1 J2
"B" HARNESS
"A" HARNESS
NOTE: THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
RAYTHEON SUPPLIED GRND CABLE
DSKY
SCM BREAKOUT
PEA TPA-2
J19 POWER AND SERVO ASSEMBLY
J53 COUPLING DATA UNIT
J1 LGC TEST CONN
BUFFER ASSEMBLY
COMPUTER TEST SET
SUBSYSTEM MOUNTING FIXTURE (SMF)
E1 SMF
E300
E1
E2
E3
W120
W128
W129
W131
W132
W134
W135
W136
W137
W138
W142
W143
W144
W226
W232
W233
W236
W237
W238
W239
P9(J218)
P12(J224)
P10(J217)
P14(J216)
P11(J223)
P13(J215)
P6(J220)
P7(J219)
P8(J222)
P5(J221)
15281E

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

FORM 00145
Chg. 7-23-65

JOB G & N SYSTEM CABLE CONNECTIONS	**JDC** 12609 **REV** G **PAGE** 4 **OF** 4
SUBSYSTEM LEM G & N SYSTEM	**ASSY**

Table 1 (cont)

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
SCM	J4	P1	W142 (6900041)	P2 P3	J1 J2	TPA-2
	J3	P2	W138 (6900040)	P1	J26	GDB

*Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage. Use the following procedure to properly connect 56P4 to 05A5J1 and 56P1 to J1:

a. Visually inspect 56P4 and 56P1 of "A" harness, 05A5J1 of LGC and J1 of SCM Breakout to insure that pins and sockets are not bent or damaged.

b. Install gasket on LGC connector and SCM Breakout connector.

c. Carefully locate 56P4 on the guide pins of 05A5J1, ease plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

d. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

e. On the sides of the connector, tighten the two captive screws and torque to 19±1 in-lbs.

f. Carefully locate 56P1 on the guide pins of J1 on SCM Breakout, ease the plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

g. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.

h. On the sides of the connector, tighten the two captive screws and torque to 19±1 in-lbs.

DATE ________

JOB G & N SYSTEM CABLE CONNECTIONS	**JDC** 12609 **REV.** H **PAGE** 1 **OF** 4
	INITIAL TDRR 27134 **D.S. PGS** –
SUBSYSTEM LEM G & N SYSTEM	**ASSY.**

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-6-66	28591	2	-	MM	ACM
B	7-5-66	30042	2	-	MM	ACM
C	7-21-66	30270	2, 3	-	EA	MB
D	8-4-66	30403	1	-	EA	-
E	9-22-66	31268	1, 2, 4	-	EA	-
F	11-25-66	32060	2, 3	-	EA	-
G	3-16-67	33219	2, 3	-	EA	-
H	7-27-67	34239	All	-	EA	-

REFERENCES PS 6015000

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: 1. Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

2. Connection of cable W226 between the buffer assembly and the LGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the LGC test connector, insure that connector assembly (2003099) is installed on the LGC test connector.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 63

JOB G & N SYSTEM CABLE CONNECTIONS	**JDC** 12609 **REV** H **PAGE** 2 **OF** 4
SUBSYSTEM LEM G & N SYSTEM	**ASSY**

Table 1

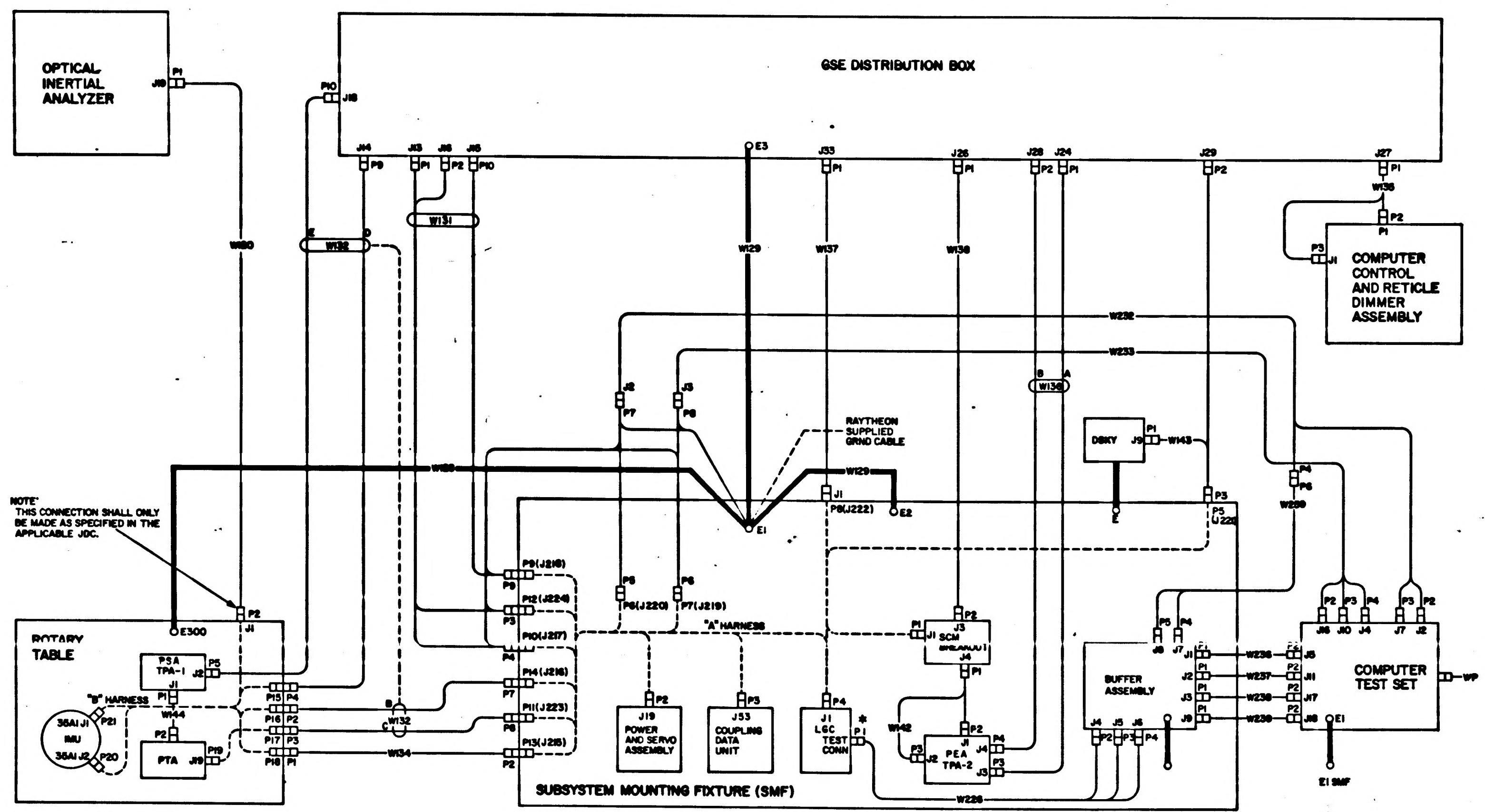
Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY
				P2	J29	GDB
	56P13 (J215)	P2	W134 (2900588)	P1	56P18	"B" Harness
	56P11 (J223)	P8	W132 (2900497)	P3	56P17	
	56P14 (J216)	P7		P2	56P16	
	56P9 (J218)	P2	W131 (6900023)	P1	J13	GDB
	56P12 (J224)	P3		P2	J16	
	56P10 (J217)	P4		P10	J15	
	56P6 (J220)	P5				
	56P7 (J219)	P6				
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14	GDB
PTA	Test Conn.	P2	W144 (3900006)	P1	J1	TPA-1
LGC	05A1J1	56P4	"A" Harness*			
SCM Breakout	J1	56P1				
LGC (see NOTE 2 above)	Test Conn.	P1	W226 (2014137)	P2 P3 P4	J4 J5 J6	LGC Buffer Assembly
GDB	J27	P1	W135 (6900024)	P3	J1	Computer Control and Reticle Dimmer Assembly
				P2	P1	

DATE ______________

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV H PAGE 3 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY


GSE DISTRIBUTION BOX
OPTICAL INERTIAL ANALYZER
J10
P1
P10
J18
J14
P9
J13
P1
J16
P2
J15
P10
E3
J33
P1
J26
P1
J28
P2
J24
P1
J29
P2
J27
P1
W136
P2
P1
P3
J1
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
W130
W132
E
D
W131
W129
W137
W138
W232
W233
B
A
W136
J2
P7
J3
P8
RAYTHEON SUPPLIED GRND CABLE
W128
W129
J1
P8(J222)
E2
E1
DSKY
J9
P1
W143
E
P3
P5
J220
P4
P6
W239
ROTARY TABLE
E300
P2
J1
PSA TPA-1
J2
P5
J1
P1
"B" HARNESS
W144
P2
PTA
J19
P19
36A1 J1
IMU
36A1 J2
P21
P20
P15
P4
P16
P2
P17
P3
P18
P1
B
C
W132
W134
P9(J218)
P9
P12(J224)
P3
P10(J217)
P4
P14(J216)
P7
P11(J223)
P8
P13(J215)
P2
P6
P6(J220)
P6
P7(J219)
"A" HARNESS
J19
P2
POWER AND SERVO ASSEMBLY
J53
P3
COUPLING DATA UNIT
J1
P4
LGC TEST CONN
P1
*
P1
J1
J3
SCM
J4
P2
P1
W142
P2
J1
P3
J2
PEA TPA-2
J4
P4
J3
P3
W226
SUBSYSTEM MOUNTING FIXTURE (SMF)
BUFFER ASSEMBLY
J8
P5
J7
P4
J1
J2
J3
J9
P1
J4
J5
J6
P2
P3
P4
W236
W237
W238
W239
P2
J5
J11
J17
J18
E1
E1 SMF
COMPUTER TEST SET
J16
J10
J4
J7
J2
P2
P3
P4
P3
P2
WP
15281E

NOTE*
THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.

*NOTE: This connection shall only be made as specified in applicable JDC's. If W226 is not connected to LGC test connector, connector assembly (2003099) must be installed on LGC test connector.

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

FORM 00145
Chg. 7-23-65

Table 1 (cont)

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
SCM Breakout	J4	P1	W142 (6900041)	P2 P3	J1 J2	TPA-2
	J3	P2	W138 (6900040)	P1	J26	GDB

***Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage. Use the following procedure to properly connect 56P4 to 05A5J1 and 56P1 to J1:**

- **a. Visually inspect 56P4 and 56P1 of "A" harness, 05A5J1 of LGC and J1 of SCM Breakout to insure that pins and sockets are not bent or damaged.**
- **b. Install gasket on LGC connector and SCM Breakout connector.**
- **c. Carefully locate 56P4 on the guide pins of 05A5J1, ease plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.**
- **d. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.**
- **e. On the sides of the connector, tighten the two captive screws and torque to 19±1 in-lbs.**
- **f. Carefully locate 56P1 on the guide pins of J1 on SCM Breakout, ease the plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.**
- **g. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19±1 in-lbs.**
- **h. On the sides of the connector, tighten the two captive screws and torque to 19±1 in-lbs.**

DATE ________

JDC 12609 REV. J PAGE 1 OF 4

JOB G & N SYSTEM CABLE CONNECTIONS

INITIAL TDRR 27134 D.S. PGS -

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-6-66	28591	2	-	MM	ACM
B	7-5-66	30042	2	-	MM	ACM
C	7-21-66	30270	2, 3	-	EA	MB
D	8-4-66	30403	1	-	EA	-
E	9-22-66	31268	1, 2, 4	-	EA	-
F	11-25-66	32060	2, 3	-	EA	-
G	3-16-67	33219	2, 3	-	EA	-
H	7-27-67	34239	All	-	EA	-
J	8-10-67	34338	All	-	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: 1. Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

2. Connection of cable W226 between the buffer assembly and the LGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the LGC test connector, insure that connector assembly (2003099) is installed on the LGC test connector.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS

JDC 12609 REV J PAGE 2 OF 4

SUBSYSTEM LEM G & N SYSTEM

ASSY

Table 1

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To	
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB	
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY	
				P2	J29	GDB	
	56P9 (J218)	P2	W131 (6900023)	P1	J13		
	56P12 (J224)	P3		P2	J16		
	56P10 (J217)	P4		P10	J15		
	56P6 (J220)	P5					
	56P7 (J219)	P6					
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14		
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1	
SCA Breakout	J1	56P1	"A" Harness*				

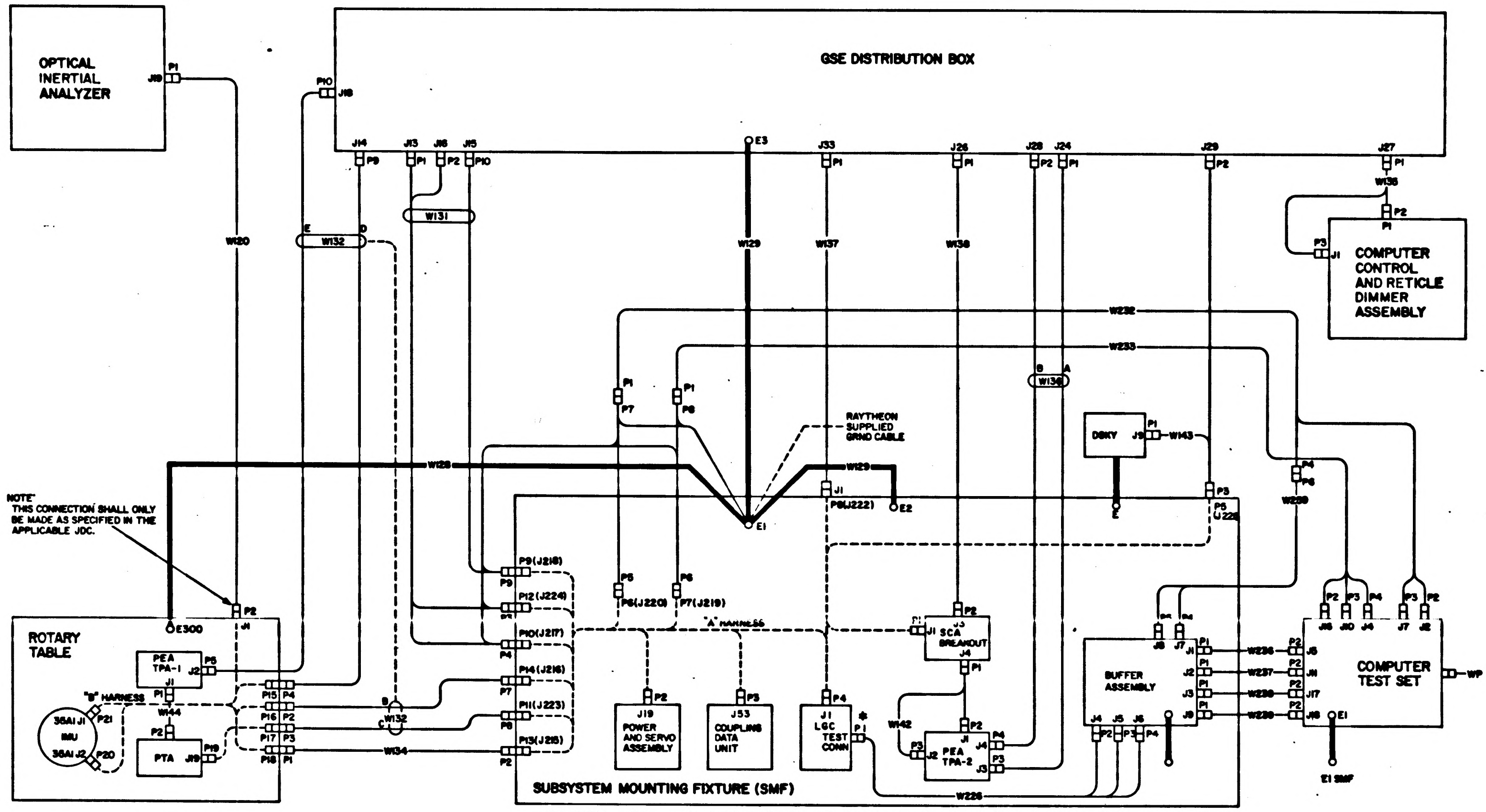
*Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage. Use the following procedure to properly connect 56P1 to J1:

a. Visually inspect 56P1 of "A" harness and J1 of SCA Breakout to insure that pins and sockets are not bent or damaged.

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV J PAGE 3 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY


OPTICAL INERTIAL ANALYZER
GSE DISTRIBUTION BOX
J19
P1
P10
J18
J14
P9
J13
P1
J16
P2
J15
P10
E3
J33
J26
J28
J24
J29
J27
W120
W132
E
D
W131
W129
W137
W138
W135
P2
P3
J1
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
W232
W233
W136
B
A
P7
P8
RAYTHEON SUPPLIED GRND CABLE
W128
W129
E1
E2
P8(J222)
DSKY
J9
W143
P3
P5
(J226)
P4
P6
W239
NOTE*
THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
E300
J1
ROTARY TABLE
PEA TPA-1
J2
P6
"B" HARNESS
W144
36A1 J1
IMU
36A1 J2
P21
P20
PTA
J19
P19
P15
P16
P17
P18
P4
P2
P3
P1
W132
B
C
W134
P9(J218)
P12(J224)
P10(J217)
P14(J216)
P11(J223)
P13(J215)
P5
P6(J220)
P6
P7(J219)
"A" HARNESS
J19 POWER AND SERVO ASSEMBLY
J53 COUPLING DATA UNIT
J1 LGC TEST CONN
*
J3 SCA BREAKOUT
J4
W142
PEA TPA-2
J3
J4
W226
SUBSYSTEM MOUNTING FIXTURE (SMF)
BUFFER ASSEMBLY
J8
J7
J1
J2
J3
J9
J4
J5
J6
W236
W237
W238
W239
J5
J11
J17
J18
J16
J10
J4
J7
J2
COMPUTER TEST SET
WP
E1
E1 SMF
15281F

*NOTE: This connection shall only be made as specified in applicable JDC's. If W226 is not connected to LGC test connector, connector assembly (2003099) must be installed on LGC test connector.

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

FORM 0014[illegible]
Chg. 7-[illegible]-65

JOB G & N SYSTEM CABLE CONNECTIONS	**JDC** 12609 **REV** J **PAGE** 4 **OF** 4
SUBSYSTEM LEM G & N SYSTEM	**ASSY**

b. Carefully locate 56P1 on the guide pins of J1 on SCA Breakout, ease the plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19 ±1 in-lbs.

d. On the sides of the connector, tighten the two captive screws and torque to 19 ±1 in-lbs.

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS

JDC 12609 **REV.** K **PAGE** 1 **OF** 4

INITIAL TDRR 27134 **D.S. PGS** -

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-6-66	28591	2	-	MM	ACM
B	7-5-66	30042	2	-	MM	ACM
C	7-21-66	30270	2, 3	-	EA	MB
D	8-4-66	30403	1	-	EA	-
E	9-22-66	31268	1, 2, 4	-	EA	-
F	11-25-66	32060	2, 3	-	EA	-
G	3-16-67	33219	2, 3	-	EA	-
H	7-27-67	34239	All	-	EA	-
J	8-10-67	34338	All	-	EA GD	-
K	1-4-68	35363	2	-	EA GD	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: 1. Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

2. Connection of cable W226 between the buffer assembly and the LGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the LGC test connector, insure that connector assembly (2003099) is installed on the LGC test connector.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS

JDC 12609 **REV** K **PAGE** 2 **OF** 4

SUBSYSTEM LEM G & N SYSTEM

ASSY

Table 1

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To	
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB	
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY	
				P2	J29	GDB	
	56P9 (J218)	P9	W131 (6900023)	P1	J13		
	56P12 (J224)	P3		P2	J16		
	56P10 (J217)	P4		P10	J15		
	56P6 (J220)	P5					
	56P7 (J219)	P6					
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14		
CCRD	J1 P1	P3 P2	W135 (6900024)	P1	J27	GDB	
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1	
SCA Breakout	J1	56P1	"A" Harness*				

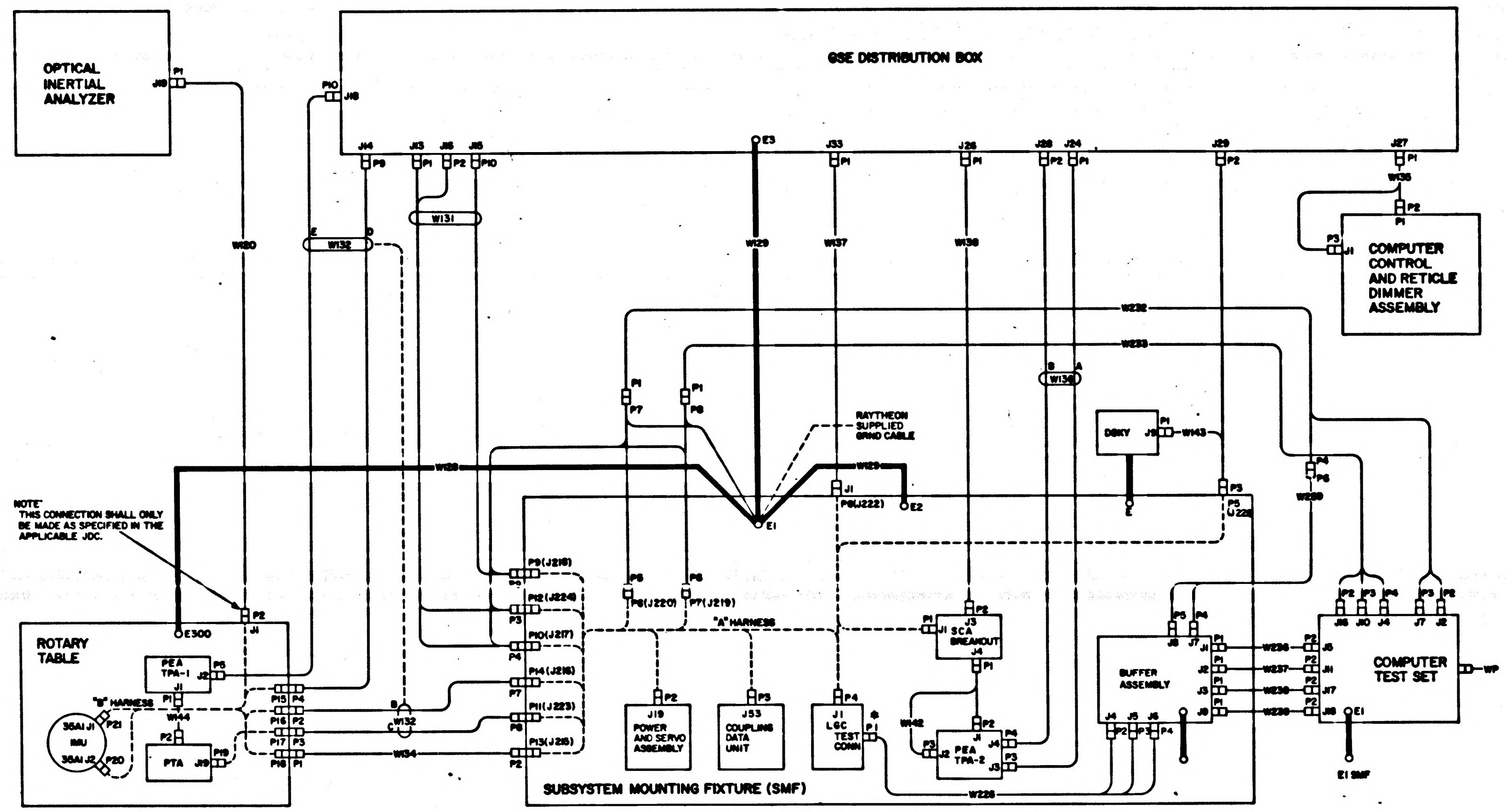
*Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage. Use the following procedure to properly connect 56P1 to J1:

a. Visually inspect 56P1 of "A" harness and J1 of SCA Breakout to insure that pins and sockets are not bent or damaged.

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV K PAGE 3 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY


GSE DISTRIBUTION BOX
OPTICAL INERTIAL ANALYZER
J19
P1
P10
J18
J14
P9
J13
P1
J16
P2
J15
P10
E3
J33
P1
J26
P1
J28
P2
J24
P1
J29
P2
J27
P1
W135
P2
P1
P3
J1
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
W120
W132
E
D
W131
W129
W137
W138
W232
W233
B
A
W136
P1
P7
P1
P8
RAYTHEON SUPPLIED GRND CABLE
DSKY
J9
P1
W143
E
W128
W129
J1
P6(J222)
E2
E1
P3
P5
J228
P4
P6
W230
NOTE*
THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
P2
J1
E300
ROTARY TABLE
PEA TPA-1
J1
J2
P5
P1
W144
P2
PTA
J19
P19
"B" HARNESS
36A1 J1
IMU
36A1 J2
P21
P20
P15
P4
P16
P2
P17
P3
P18
P1
B
W132
C
W134
P9(J218)
P12(J224)
P3
P10(J217)
P4
P14(J216)
P7
P11(J223)
P8
P13(J215)
P2
P6
P8(J220)
P8
P7(J219)
"A" HARNESS
P2
J19 POWER AND SERVO ASSEMBLY
P3
J53 COUPLING DATA UNIT
P4
J1 LGC TEST CONN
*
P1
P2
J3 SCA BREAKOUT
J1
P1
J4
P1
W142
P2
J1
PEA TPA-2
J2
P3
J4
P4
J3
P3
W226
SUBSYSTEM MOUNTING FIXTURE (SMF)
P5
P4
J8
J7
BUFFER ASSEMBLY
J1
J2
J3
J9
P1
J4
J5
J6
P2
P3
P4
W236
W237
W238
W239
P2
J5
J11
J17
J18
COMPUTER TEST SET
E1
E1 SMF
WP
P2
P3
P4
P3
P2
J16
J10
J4
J7
J2
16881F

*NOTE: This connection shall only be made as specified in applicable JDC's. If W226 is not connected to LGC test connector, connector assembly (2003099) must be installed on LGC test connector.

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS	**JDC** 12609 **REV** K **PAGE** 4 OF 4
SUBSYSTEM LEM G & N SYSTEM	**ASSY**

b. Carefully locate 56P1 on the guide pins of J1 on SCA Breakout, ease the plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19 ±1 in-lbs.

d. On the sides of the connector, tighten the two captive screws and torque to 19 ±1 in-lbs.

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | **JDC** 12609 **REV.** L **PAGE** 1 **OF** 5

INITIAL TDRR 27134 **D.S. PGS.** -

SUBSYSTEM LEM G & N SYSTEM | **ASSY.**

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-6-66	28591	2	-	MM	ACM
B	7-5-66	30042	2	-	MM	ACM
C	7-21-66	30270	2, 3	-	EA	MB
D	8-4-66	30403	1	-	EA	-
E	9-22-66	31268	1, 2, 4	-	EA	-
F	11-25-66	32060	2, 3	-	EA	-
G	3-16-67	33219	2, 3	-	EA	-
H	7-27-67	34239	All	-	EA	-
J	8-10-67	34338	All	-	EA AD	-
K	1-4-68	35363	2	-	EA AD	-
L	3-22-68	35930	1	-	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines, and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | **JDC** 12609 **REV** L **PAGE** 2 **OF** 5

SUBSYSTEM LEM G & N SYSTEM | **ASSY**

forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.)

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may damage connector.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: 1. Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

2. Connection of cable W226 between the buffer assembly and the LGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the LGC test connector, insure that connector assembly (2003099) is installed on the LGC test connector.

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | **JDC** 12609 **REV** L **PAGE** 3 **OF** 5

SUBSYSTEM LEM G & N SYSTEM | **ASSY**

Table 1

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To	
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB	
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY	
				P2	J29	GDB	
	56P9 (J218)	P9	W131 (6900023)	P1	J13		
	56P12 (J224)	P3		P2	J16		
	56P10 (J217)	P4		P10	J15		
	56P6 (J220)	P5					
	56P7 (J219)	P6					
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14		
CCRD	J1 P1	P3 P2	W135 (6900024)	P1	J27	GDB	
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1	
SCA Breakout	J1	56P1	"A" Harness*				

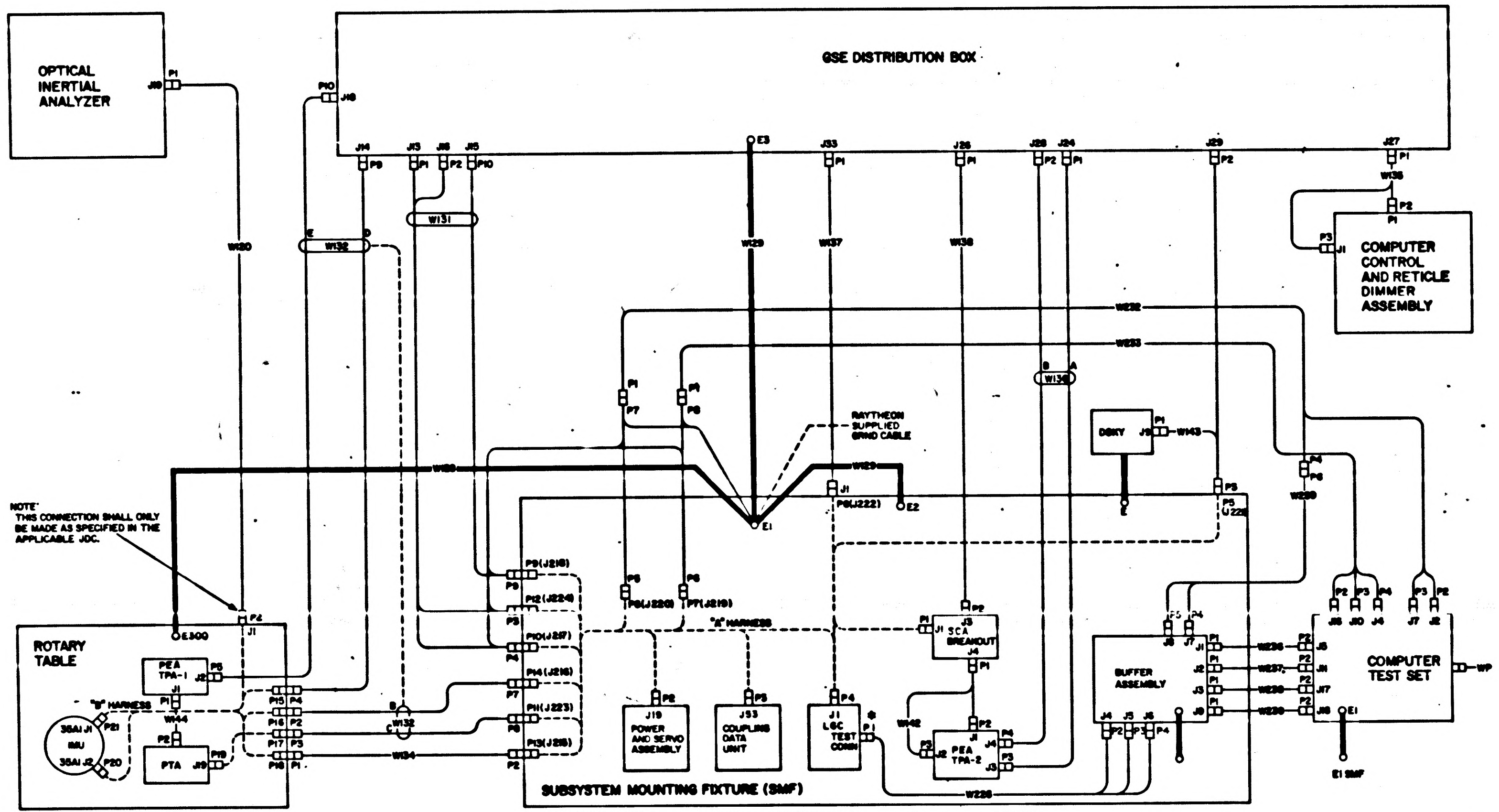
*Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage. Use the following procedure to properly connect 56P1 to J1:

a. Visually inspect 56P1 of "A" harness and J1 of SCA Breakout to insure that pins and sockets are not bent or damaged.

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV L PAGE 4 OF 5

SUBSYSTEM LEM G & N SYSTEM | ASSY


GSE DISTRIBUTION BOX
OPTICAL INERTIAL ANALYZER
J10
P1
P10
J18
J14
J13
J16
J15
P9
P1
P2
P10
W130
W132
E
D
W131
E3
W129
J33
W137
J26
W138
J28
J24
P2
P1
J29
P2
J27
P1
W135
P2
P1
P3
J1
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
W232
W233
B
A
W136
P7
P8
RAYTHEON SUPPLIED GRND CABLE
DSKY
J9
W143
P4
P6
W230
W128
W129
J1
P6(J222)
E2
E1
E
P5
P5 (J222)
NOTE*
THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
P2
J1
E300
ROTARY TABLE
PEA TPA-1
J2
P5
"B" HARNESS
36A1 J1
IMU
36A1 J2
P21
P20
W144
PTA
J19
P19
P15
P16
P17
P18
P4
P2
P3
P1
W134
C
P9(J218)
P9
P12(J224)
P3
P10(J217)
P4
P14(J216)
P7
P11(J223)
P8
P13(J215)
P2
P6(J220)
P7(J219)
"A" HARNESS
J19 POWER AND SERVO ASSEMBLY
J53 COUPLING DATA UNIT
J1 LGC TEST CONN
P4
*
P1
J3 SCA BREAKOUT J4
W142
PEA TPA-2
J1
J2
J3
J4
P3
W226
SUBSYSTEM MOUNTING FIXTURE (SMF)
BUFFER ASSEMBLY
J8
J7
J4
J5
J6
W236
W237
W238
W239
J5
J11
J17
J16
J10
J7
J2
COMPUTER TEST SET
WP
E1
E1 SMF
15881F

*NOTE: This connection shall only be made as specified in applicable JDC's. If W226 is not connected to LGC test connector, connector assembly (2003099) must be installed on LGC test connector.

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

b. Carefully locate 56P1 on the guide pins of J1 on SCA Breakout, ease the plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19 ±1 in-lbs.

d. On the sides of the connector, tighten the two captive screws and torque to 19 ±1 in-lbs.

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV. M PAGE 1 OF 5
INITIAL TDRR 27134 D.S. PGS -

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	D.S.	APPROVAL MIT	NASA
A	5-6-66	28591	2	-	MM	ACM
B	7-5-66	30042	2	-	MM	AC
C	7-21-66	30270	2, 3	-	EA	MB
D	8-4-66	30403	1	-	EA	-
E	9-22-66	31268	1, 2, 4	-	EA	-
F	11-25-66	32060	2, 3	-	EA	-
G	3-16-67	33219	2, 3	-	EA	-
H	7-27-67	34239	All	-	EA	-
J	8-10-67	34338	All	-	EA	-
K	1-4-68	35363	2	-	EA	-
L	3-22-68	35930	1	-	EA	-
M	9-26-68	36861	1	-	EA	-

REFERENCES PS 6015000

IMPORTANT

See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT:

Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion

VERIFICATION WITH SIOL REQUIRED BEFORE USE

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV M PAGE 2 OF 5

SUBSYSTEM LEM G & N SYSTEM | ASSY

axis, as indicated by position lines, and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.)

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may damage connector.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: 1. Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

2. Connection of cable W226 between the buffer assembly and the LGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the LGC test connector, insure that connector assembly (2003099) is installed on the LGC test connector.

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS | JDC 12609 REV M PAGE 3 OF 5

SUBSYSTEM LEM G & N SYSTEM | ASSY

Table 1

Cable Connections

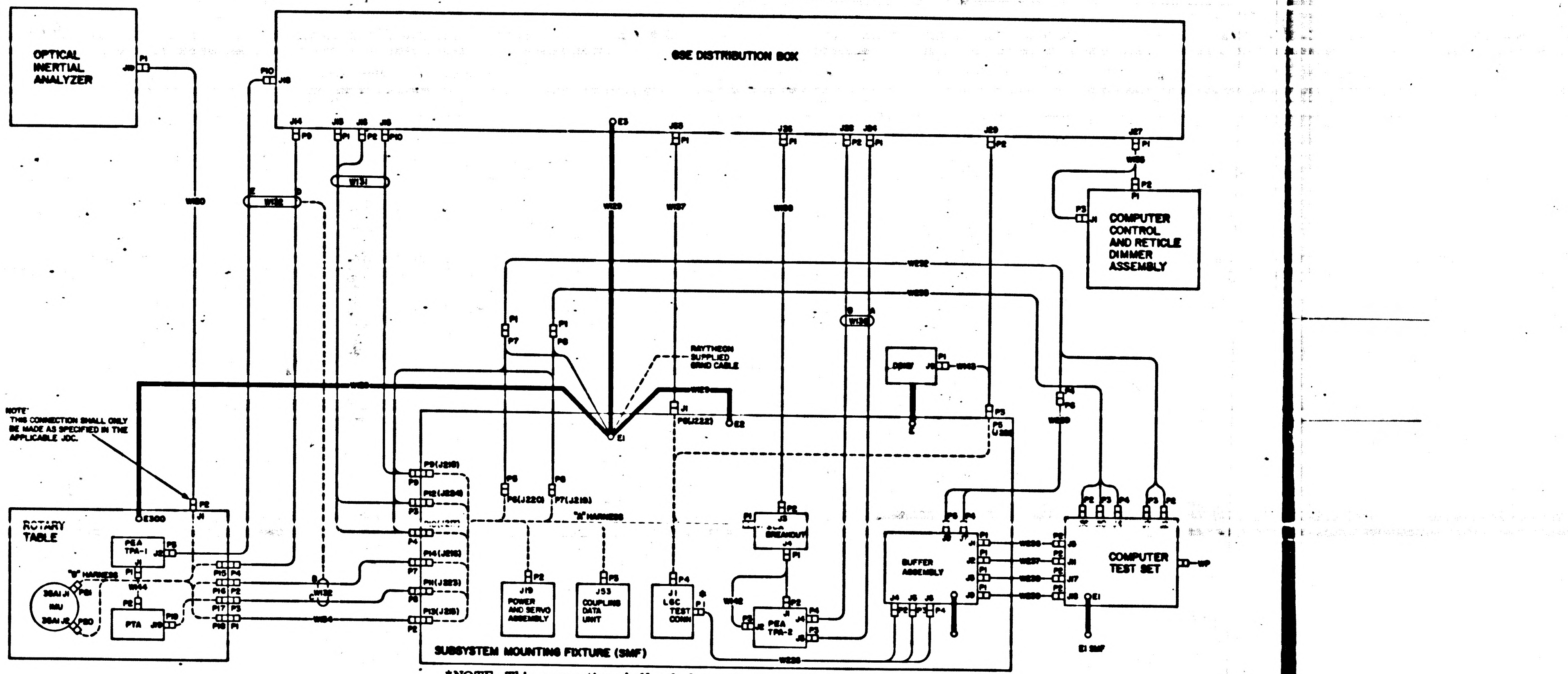
From	Conn. No.		Cable and Drawing No.	Conn. No.		To	
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB	
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY	
				P2	J29	GDB	
	56P9 (J218)	P9	W131 (6900023)	P1	J13		
	56P12 (J224)	P3		P2	J16		
	56P10 (J217)	P4		P10	J15		
	56P6 (J220)	P5					
	56P7 (J219)	P6					
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14		
CCRD	J1 P1	P3 P2	W135 (6900024)	P1	J27	GDB	
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1	
SCA Breakout	J1	56P1	"A" Harness*				

*Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage. Use the following procedure to properly connect 56P1 to J1:

a. Visually inspect 56P1 of "A" harness and J1 of SCA Breakout to insure that pins and sockets are not bent or damaged.

DATE 15 MAR 66

JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV M PAGE 4 OF 5
SUBSYSTEM LEM G & N SYSTEM	ASSY


OPTICAL INERTIAL ANALYZER
GSE DISTRIBUTION BOX
ROTARY TABLE
PEA TPA-1
PTA
IMU
"B" HARNESS
NOTE: THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
RAYTHEON SUPPLIED GRND CABLE
W131
W132
W130
W129
W137
W138
W232
W233
W226
W144
W142
W136
E1
E2
E3
E300
"A" HARNESS
P9(J218)
P12(J224)
P14(J216)
P11(J223)
P13(J215)
P6(J220)
P7(J219)
P6(J222)
J19 POWER AND SERVO ASSEMBLY
J53 COUPLING DATA UNIT
J1 LGC TEST CONN
BREAKOUT
PEA TPA-2
BUFFER ASSEMBLY
COMPUTER TEST SET
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
SUBSYSTEM MOUNTING FIXTURE (SMF)
E1 SMF

*NOTE: This connection shall only be made as specified in applicable JDC's. If W226 is not connected to LGC test connector, connector assembly (2003099) must be installed on LGC test connector.

Figure 1. A/B-GSE Connections

DATE 15 MAR 66

FORM 00145
Chg. 7-23-65

b. Carefully locate 56P1 on the guide pins of J1 on SCA Breakout, ease the plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19 ±1 in-lbs.

d. On the sides of the connector, tighten the two captive screws and torque to 19 ±1 in-lbs.

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JOB G & N SYSTEM CABLE CONNECTIONS

JDC 12609 **REV.** N **PAGE** 1 **OF** 5

INITIAL TDRR 27134 **D.S. PGS** -

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	5-6-66	28591	2	-	MM	ACM
B	7-5-66	30042	2	-	MM	ACM
C	7-21-66	30270	2, 3	-	EA	MB
D	8-4-66	30403	1	-	EA	-
E	9-22-66	31268	1, 2, 4	-	EA	-
F	11-25-66	32060	2, 3	-	EA	-
G	3-16-67	33219	2, 3	-	EA	-
H	7-27-67	34239	All	-	EA	-
J	8-10-67	34338	All	-	EA	-
K	1-4-68	35363	2	-	EA	-
L	3-22-68	35930	1	-	EA	-
M	9-26-68	36861	1	-	EA	-
N	10-10-69	37856	5	-	EA	-

REFERENCES PS 6015000

IMPORTANT

See below.

INTERVAL

TOOLS AND MATERIAL

IMPORTANT:

Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.

2. With the connector aligned to the receptacle along the insertion

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JOB G & N SYSTEM CABLE CONNECTIONS

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SUBSYSTEM LEM G & N SYSTEM

ASSY

axis, as indicated by position lines, and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.)

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may damage connector.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: 1. Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

2. Connection of cable W226 between the buffer assembly and the LGC test connector is necessary only when performing JDC's which specify this connection. In JDC's which do not specify connection of P1 of cable W226 to the LGC test connector, insure that connector assembly (2003099) is installed on the LGC test connector.

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JOB G & N SYSTEM CABLE CONNECTIONS

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ASSY

Table 1

Cable Connections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To	
"A" Harness	56P8 (J222)	J1	W137 (6900005)	P1	J33	GDB	
	56P5 (J221)	P3	W143 (6900026)	P1	J9	DSKY	
				P2	J29	GDB	
	56P9 (J218)	P9	W131 (6900023)	P1	J13		
	56P12 (J224)	P3		P2	J16		
	56P10 (J217)	P4		P10	J15		
	56P6 (J220)	P5					
	56P7 (J219)	P6					
"B" Harness	56P15 (J226)	P4	W132 (2900497)	P9	J14		
CCRD	J1 P1	P3 P2	W135 (6900024)	P1	J27	GDB	
PTA	Test Conn.	P2	W144 (6900006)	P1	J1	TPA-1	
SCA Breakout	J1	56P1	"A" Harness*				

*Extreme care must be exercised when connecting harness connectors to component connectors to prevent pin and jack damage. Use the following procedure to properly connect 56P1 to J1:

a. Visually inspect 56P1 of "A" harness and J1 of SCA Breakout to insure that pins and sockets are not bent or damaged.

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JOB G & N SYSTEM CABLE CONNECTIONS

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b. Carefully locate 56P1 on the guide pins of J1 on SCA Breakout, ease the plug onto the connector maintaining parallelism between plug and connector as closely as possible and engage the four corner jackscrews until finger tight.

c. To fully engage plug and connector, turn each jackscrew one turn at a time moving around the connector in sequence. When fully engaged, torque each jackscrew to 19 ±1 in-lbs.

d. On the sides of the connector, tighten the two captive screws and torque to 19 ±1 in-lbs.

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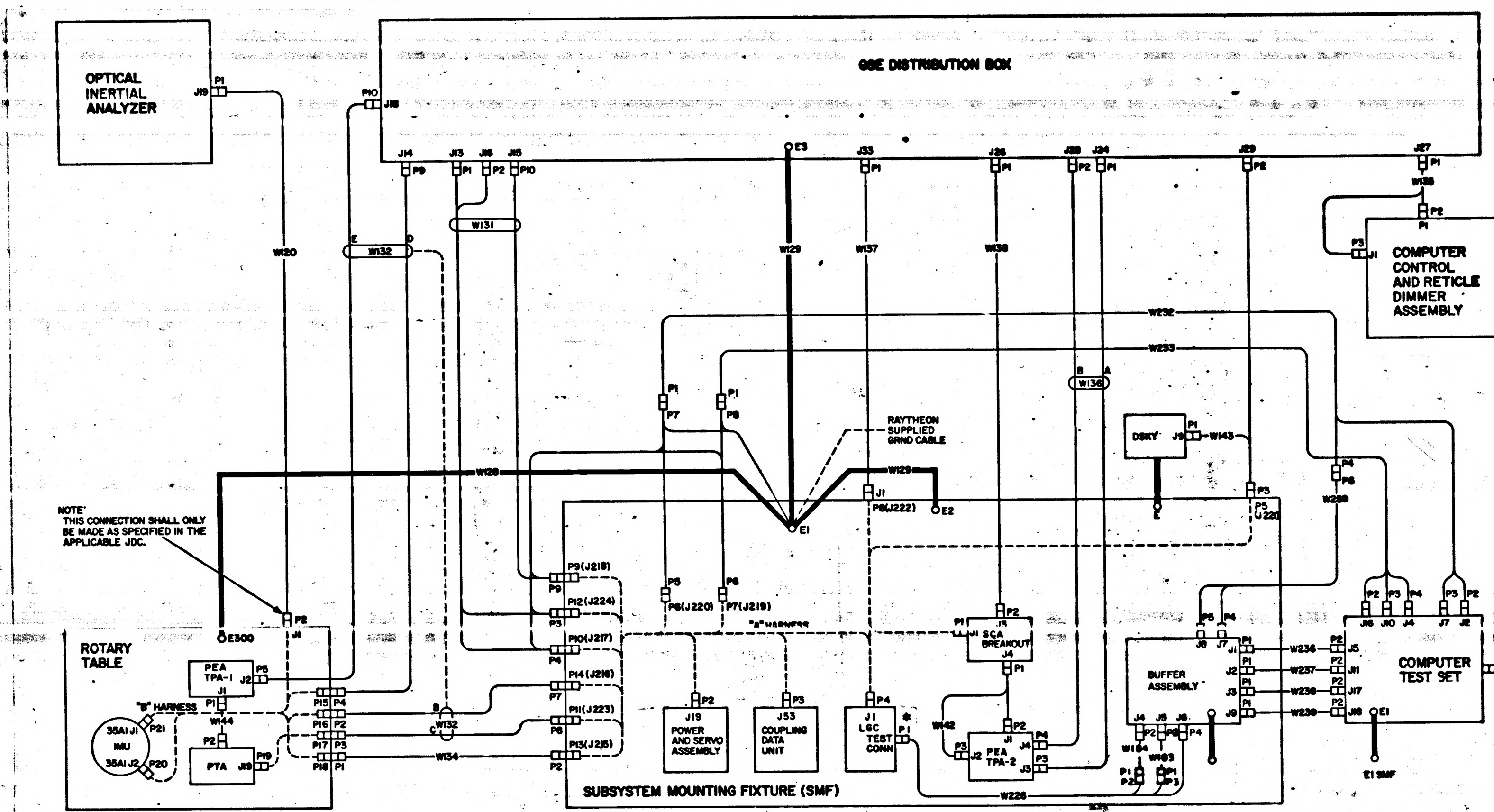
JOB G & N SYSTEM CABLE CONNECTIONS	JDC 12609 REV N PAGE 5 OF 5
SUBSYSTEM LEM G & N SYSTEM	ASSY


GSE DISTRIBUTION BOX
OPTICAL INERTIAL ANALYZER
J19 P1
W120
P10 J18
J14 P9
J13 P1
J16 P2
J15 P10
W131
W132
E D
E3
J33 P1
J26 P1
J38 P2
J34 P1
J29 P2
J27 P1
W135
P2
P1
P3 J1
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
W129
W137
W138
W232
W233
B A
W136
P1 P7
P1 P8
RAYTHEON SUPPLIED GRND CABLE
DSKY J9 P1 W143
W128
W129
J1
P6(J222)
E2
E1
P3
P5 J221
P4 P6
W259
NOTE
THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
P2 J1
E300
ROTARY TABLE
PEA TPA-1 J2 P5
J1 P1
"B" HARNESS
35A1 J1 P21
IMU
35A1 J2 P20
W144
P2
PTA J19 P19
P15 P4
P16 P2
P17 P3
P18 P1
B C W132
W134
P9(J218) P9
P12(J224) P3
P10(J217) P4
P14(J216) P7
P11(J223) P8
P13(J215) P2
P5 P6(J220)
P6 P7(J219)
"A" HARNESS
P2 J19 POWER AND SERVO ASSEMBLY
P3 J53 COUPLING DATA UNIT
P4 J1 LGC TEST CONN
* P1
SUBSYSTEM MOUNTING FIXTURE (SMF)
P1 J1 SCA BREAKOUT J4 P2 P1
W142
P2 J1 PEA TPA-2 J2 P3 J4 P4 J3 P3
W226
BUFFER ASSEMBLY
P5 P4 J8 J7
J1 P1 W236 P2 J5
J2 P1 W237 P2 J11
J3 P1 W238 P2 J17
J9 P1 W239 P2 J18
J4 J5 J6 P2 P3 P4
W184 W183
P1 P2 P1 P3
E
COMPUTER TEST SET
P2 P3 P4 P3 P2
J16 J10 J4 J7 J2
WP
E1
E1 SMF

*NOTE: This connection shall only be made as specified in applicable JDC's. If W226 is not connected to LGC test connector, connector assembly (2003099) must be installed on LGC test connector.

NOTE: USE W183 AND W184 AT AC ELECTRONICS ONLY.

Figure 1. A/B-GSE Connections

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JOB G & N SYSTEM CABLE CONNECTIONS

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INITIAL TDRR - D.S. PGS -

TDRR 27134 MAR 1 5 1966

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Performance of GSE to A/B cable connections.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA

REFERENCES PS 6015000

IMPORTANT See Below

INTERVAL

TOOLS AND MATERIAL

A. SAFETY REQUIREMENTS

1. All circuit breakers supplying OIA power to G & N equipment shall be in the OFF position.

2. All signal carrying circuits beginning, terminating, or going through the G & N equipment shall be de-energized, except for IMU auxiliary temperature control.

B. PROCEDURE

1. Connect the cables as indicated in Table 1. (See Figure 1.)

NOTE: Connector 35A1J1 is not mated at this time because heaters must remain attached to provide power through the portable temperature controller until power can be supplied by the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N SYSTEM CABLE CONNECTIONS

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SUBSYSTEM LEM G & N SYSTEM

ASSY

Table I

GSE-GSE Interconnections

From	Conn. No.		Cable and Drawing No.	Conn. No.		To
PTA		P2	W144 (6900006)	P1	J1	TPA-1
"B" Harness	56P18				P1	W134
	56P17				P3	W132
	56P16				P2	
	56F15				P4	
"A" Harness	56P13				P2	W134
	56P11				P8	W132
	56P14				P7	
	56P10				P4	W131
	56P12				P3	
	56P6				P5	
	56P7				P6	
	56P9				P9	
	56P8	J1	W137 (6900005)	P1	J33	GDB
	56P5	P3	W143 (6900025)	P2	J29	
				P1	J1	DSKY
	56P1				J1	SCM Breakout
TPA-2	J1 J2	P2 P3	W142 (6900041)	P1	J4	
GDB	J26	P1	W138 (6900040)	P2	J3	
	J27	P1	W135 (6900024)	P2 P3	P1 J1	Computer Control and Reticle Dimmer
Buffer Assembly	J4 J5 J6	P1 P2 P3	W226 (2014137)	P4	Test Conn.	IGC

DATE

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JOB G & N SYSTEM CABLE CONNECTIONS

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SUBSYSTEM LEM G & N SYSTEM

ASSY

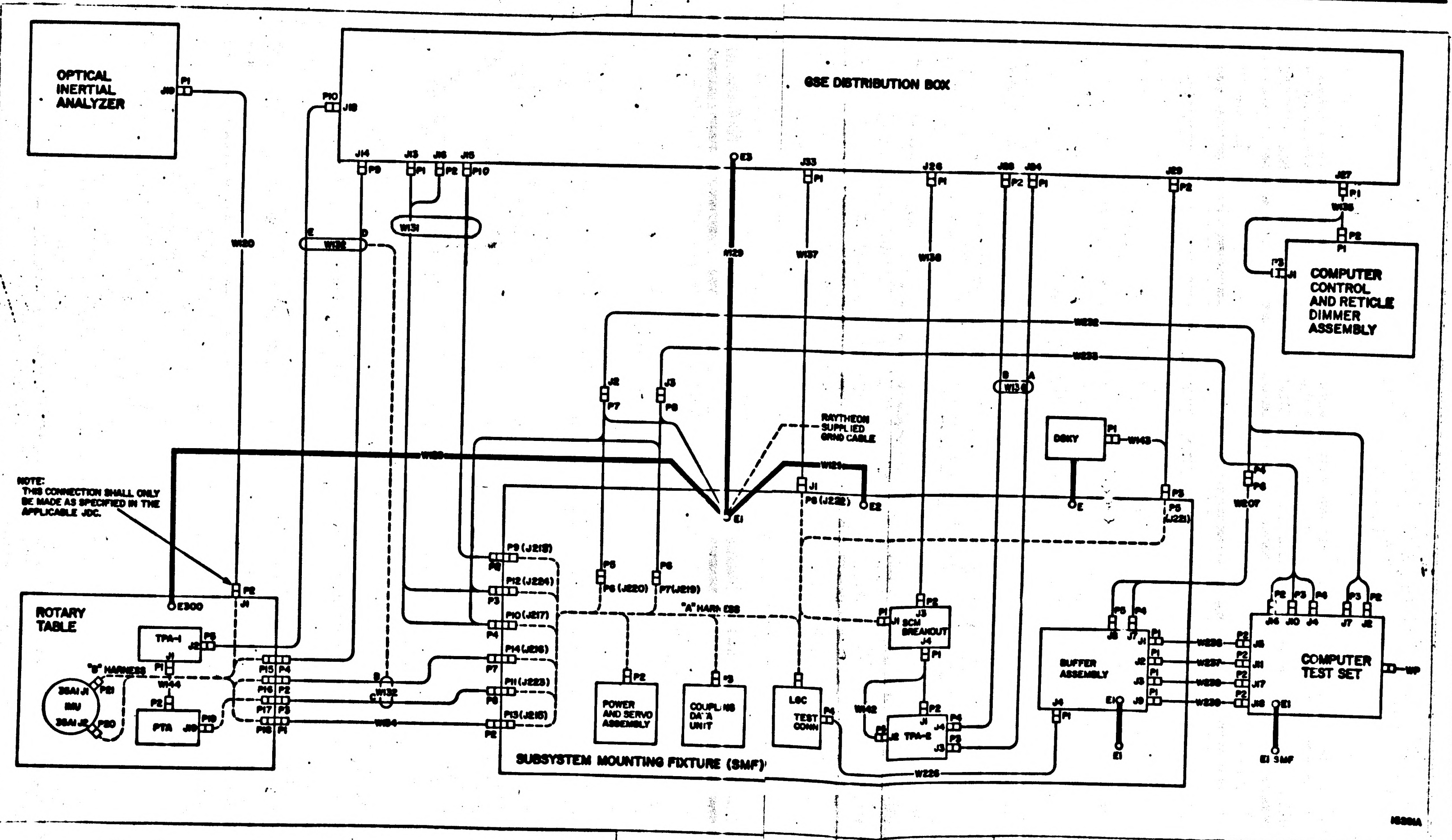
OPTICAL INERTIAL ANALYZER
GSE DISTRIBUTION BOX
COMPUTER CONTROL AND RETICLE DIMMER ASSEMBLY
ROTARY TABLE
TPA-1
PTA
IMU
"B" HARNESS
"A" HARNESS
NOTE: THIS CONNECTION SHALL ONLY BE MADE AS SPECIFIED IN THE APPLICABLE JDC.
RAYTHEON SUPPLIED GRND CABLE
DSKY
SCM BREAKOUT
TPA-2
BUFFER ASSEMBLY
COMPUTER TEST SET
POWER AND SERVO ASSEMBLY
COUPLING DATA UNIT
LGC TEST CONN
SUBSYSTEM MOUNTING FIXTURE (SMF)
W130
W131
W132
W134
W135
W137
W138
W139
W129
W142
W143
W144
W207
W226
W232
W233
E1
E2
E3
E300
E1 SMF
16594A

Figure 1. A/B-GSE Connections

DATE

JOB COOLANT HOSE CONNECTION
JDC 12610 REV. A PAGE 1 OF 2
INITIAL TDRR 25341 DS.PGS 0
SUBSYSTEM LEM G & N SYSTEM
ASSY.
DESCRIPTION Prepare Coolant and Power Console for G & N System Test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26934	1	-	WK	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Connect PSA, CDU, and LGC Coldplates to the Subsystem Mounting Fixture (SMF).

2. Purge and fill the IMU in accordance with JDC 18045 if IMU is empty.

3. Insure that the coolant hoses shown in Figure 1 have been purged and filled.

NOTE: Remove IMU snap-
on bellows from IMU
before performing step 4.

4. Connect the Coolant hoses to the G & N system components and to the G & N Coolant and Power Console as shown in Figure 1.

5. Connect cable W141 from Temperature Indicating Assembly A1J3, on the GDB to PSA, CDU, LGC, PTA coldplate and the IMU.

NOTE: If continuing from ISS Testing, make connections as necessary to comply with Figure 1.

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JOB COOLANT HOSE CONNECTION
JDC 12610 REV A PAGE 2 OF 2
SUBSYSTEM LEM G & N SYSTEM
ASSY

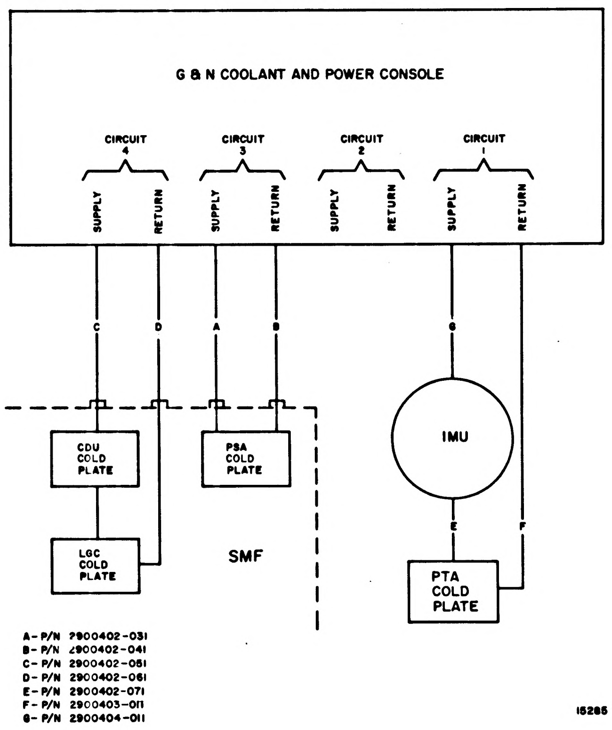
G & N COOLANT AND POWER CONSOLE
CIRCUIT 4
CIRCUIT 3
CIRCUIT 2
CIRCUIT 1
SUPPLY
RETURN
SUPPLY
RETURN
SUPPLY
RETURN
SUPPLY
RETURN
C
D
A
B
G
CDU COLD PLATE
PSA COLD PLATE
IMU
LGC COLD PLATE
SMF
E
F
PTA COLD PLATE
A-P/N 2900402-031
B-P/N 2900402-041
C-P/N 2900402-051
D-P/N 2900402-061
E-P/N 2900402-071
F-P/N 2900403-011
G-P/N 2900404-011
15285

Figure 1. Coolant Hose Connections - G and N System Testing

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JOB COOLANT HOSE CONNECTION

INITIAL TDRR 25341 D.S. PGS 0

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Prepare Coolant and Power Console for G & N System Test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26934	1	-	WK	-
B	5-25-66	29173	All	-	MM	ACM

REFERENCES
PS 6015000, JDC 18045

IMPORTANT

INTERVAL

TOOLS AND MATERIAL
Filling and Purging Fixture

PROCEDURE

1. Insure that the PTA, PSA, CDU and LGC Coldplates, the IMU, and the coolant hoses have been purged and filled. (Refer to JDC 18045 for purging and filling procedures.)

NOTE: If continuing from ISS testing, make only additional connections necessary to comply with Figure 1. Insure the IMU snap-on bellows are removed prior to performance of step 2.

2. Connect coolant hoses per Figure 1.

3. Connect cable W141 from Temperature Indicating Assembly, A1J3 on the GDB, to the PTA, PSA, CDU and LGC coldplates and the IMU inlet coolant hose.

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JOB COOLANT HOSE CONNECTION

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SUBSYSTEM LEM G & N SYSTEM

ASSY

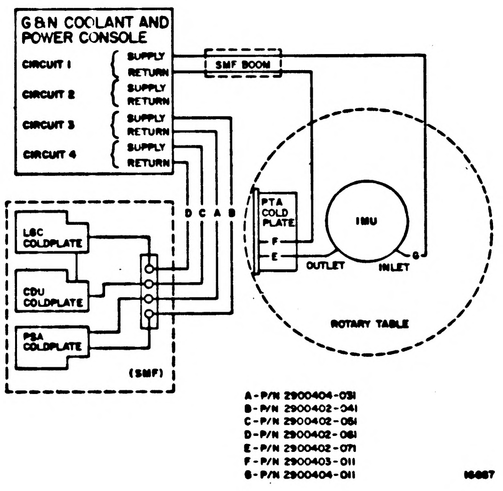
G&N COOLANT AND POWER CONSOLE
CIRCUIT 1
CIRCUIT 2
CIRCUIT 3
CIRCUIT 4
SUPPLY
RETURN
SUPPLY
RETURN
SUPPLY
RETURN
SUPPLY
RETURN
SMF BOOM
D
C
A
B
PTA COLD PLATE
F
E
IMU
OUTLET
INLET
G
ROTARY TABLE
LGC COLDPLATE
CDU COLDPLATE
PSA COLDPLATE
(SMF)
A-P/N 2900404-031
B-P/N 2900402-041
C-P/N 2900402-051
D-P/N 2900402-061
E-P/N 2900402-071
F-P/N 2900403-011
G-P/N 2900404-011
16687

Figure 1. Coolant Hose Connections - G and N System Testing

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INITIAL TDRR 25341 D.S. PGS 0

JOB COOLANT HOSE CONNECTION

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Prepare Coolant and Power Console for G & N System Test.

Ⓜ

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26934	1	-	WK	-
B	5-25-66	29173	All	-	MM	ACM
C	1-28-69	37273	2	-	EA	-

REFERENCES PS 6015000, JDC 18045

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Filling and Purging Fixture

PROCEDURE

1. Insure that the PTA, PSA, CDU and LGC Coldplates, the IMU, and the coolant hoses have been purged and filled. (Refer to JDC 18045 for purging and filling procedures.)

   NOTE: If continuing from ISS testing, make only additional connections necessary to comply with Figure 1. Insure the IMU snap-on bellows are removed prior to performance of step 2.

2. Connect coolant hoses per Figure 1.

3. Connect cable W141 from Temperature Indicating Assembly, A1J3 on the GDB, to the PTA, PSA, CDU and LGC coldplates and the IMU inlet coolant hose.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JOB COOLANT HOSE CONNECTION JDC 12610 REV C PAGE 2 OF 2

SUBSYSTEM LEM G & N SYSTEM ASSY

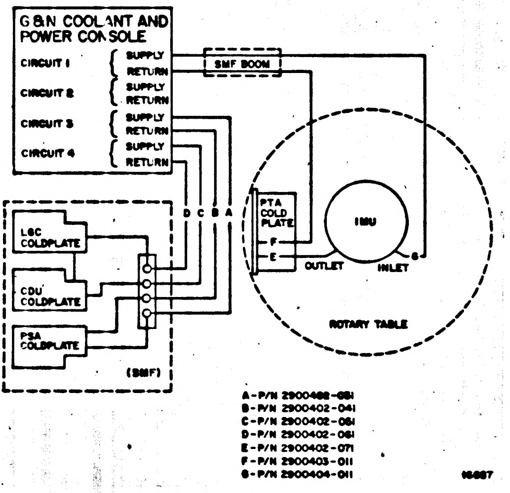
G&N COOLANT AND POWER CONSOLE
CIRCUIT 1
CIRCUIT 2
CIRCUIT 3
CIRCUIT 4
SUPPLY
RETURN
SUPPLY
RETURN
SUPPLY
RETURN
SUPPLY
RETURN
SMF BOOM
D C B A
LGC COLDPLATE
CDU COLDPLATE
PSA COLDPLATE
(SMF)
PTA COLD PLATE
F
E
IMU
OUTLET
INLET
G
ROTARY TABLE
A-P/N 2900402-051
B-P/N 2900402-041
C-P/N 2900402-061
D-P/N 2900402-061
E-P/N 2900402-071
F-P/N 2900403-011
G-P/N 2900404-011
16687

Figure 1. Coolant Hose Connections - G and N System Testing

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JOB COOLANT HOSE CONNECTION

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SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION Prepare Coolant and Power Console for G & N System Test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D.S.	MIT	NASA
A	3-8-66	26934	1	-	WK	-
B	5-25-66	29173	All	-	MM	ACM
C	1-28-69	37273	2	-	EA	-
D	8-4-69	37719	1	-	EA	-

REFERENCES
PS 6015000, JDC 18045

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL
Filling and Purging Fixture, Polyurethane foam cleanroom wiper

IMPORTANT

CAUTION: Use polyurethane foam cleanroom wiper to prevent coolant spillage on airborne equipment by wrapping wiper around quick-disconnect during mating and demating operations.

PROCEDURE

1. Insure that the PTA, PSA, CDU and LGC Coldplates, the IMU, and the coolant hoses have been purged and filled. (Refer to JDC 18045 for purging and filling procedures.)

NOTE: If continuing from ISS testing, make only additional connections necessary to comply with Figure 1. Insure the IMU snap-on bellows are removed prior to performance of step 2.

2. Connect coolant hoses per Figure 1.
3. Connect cable W141 from Temperature Indicating Assembly, A1J3 on the GDB, to the PTA, PSA, CDU and LGC coldplates and the IMU inlet coolant hose.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JOB COOLANT HOSE CONNECTION **JDC** 12610 **REV** D **PAGE** 2 **OF** 2

SUBSYSTEM LEM G & N SYSTEM **ASSY**

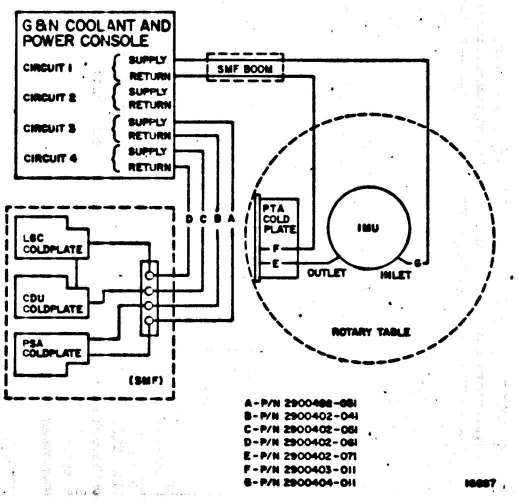
G&N COOLANT AND POWER CONSOLE
CIRCUIT 1
SUPPLY
RETURN
CIRCUIT 2
SUPPLY
RETURN
CIRCUIT 3
SUPPLY
RETURN
CIRCUIT 4
SUPPLY
RETURN
SMF BOOM
D
C
B
A
LGC COLDPLATE
CDU COLDPLATE
PSA COLDPLATE
(SMF)
PTA COLD PLATE
F
E
IMU
OUTLET
INLET
G
ROTARY TABLE
A-P/N 2900402-081
B-P/N 2900402-041
C-P/N 2900402-051
D-P/N 2900402-061
E-P/N 2900402-071
F-P/N 2900403-011
G-P/N 2900404-011
16687

Figure 1. Coolant Hose Connections - G and N System Testing

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JOB COOLANT HOSE CONNECTION

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SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Prepare Coolant and Power Console for G & N System Test.

Rev. Let.	Date	TDRR NO.	PAGES REVISED		APPROVAL	
			JDC	D. S.	MIT	NASA

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

1. Connect PSA, CDU, and LGC Coldplates to the Subsystem Mounting Fixture (SMF).
2. Purge and fill the IMU.
3. Insure that the coolant hoses shown in Figure 1 have been purged and filled.

   NOTE: Remove IMU snap-on bellows from IMU before performing step 4.
4. Connect the Coolant hoses to the G & N system components and to the G & N Coolant and Power Console as shown in Figure 1.
5. Connect cable W141 from Temperature Indicating Assembly A1J3, on the GDB to PSA, CDU, LGC, PTA coldplate and the IMU.

NOTE: If continuing from ISS Testing, make connections as necessary to comply with Figure 1.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE

JOB COOLANT HOSE CONNECTION

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SUBSYSTEM LEM G & N SYSTEM

ASSY

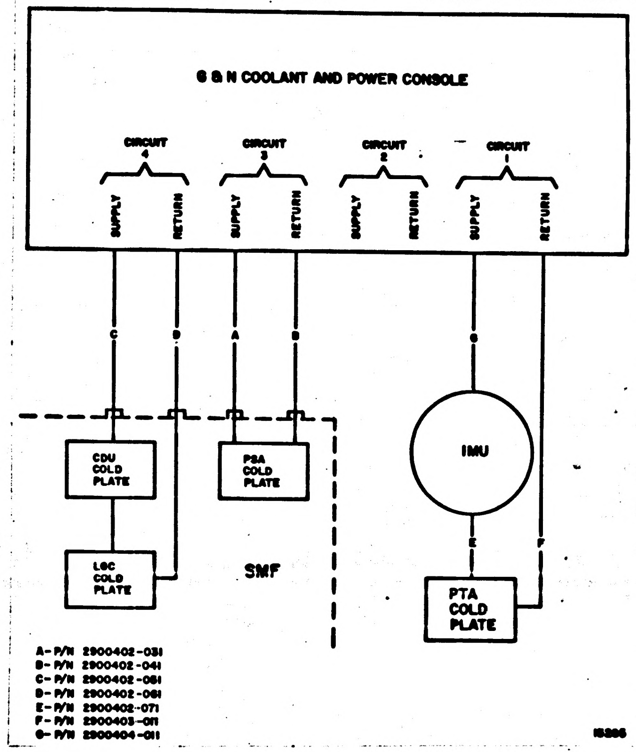
G & N COOLANT AND POWER CONSOLE
CIRCUIT 4
CIRCUIT 3
CIRCUIT 2
CIRCUIT 1
SUPPLY
RETURN
SUPPLY
RETURN
SUPPLY
RETURN
SUPPLY
RETURN
C
D
A
B
G
CDU COLD PLATE
PSA COLD PLATE
IMU
LGC COLD PLATE
SMF
E
F
PTA COLD PLATE
A- P/N 2900402-031
B- P/N 2900402-041
C- P/N 2900402-051
D- P/N 2900402-061
E- P/N 2900402-071
F- P/N 2900403-011
G- P/N 2900404-011

Figure 1. Coolant Hose Connections - G and N System Testing

DATE